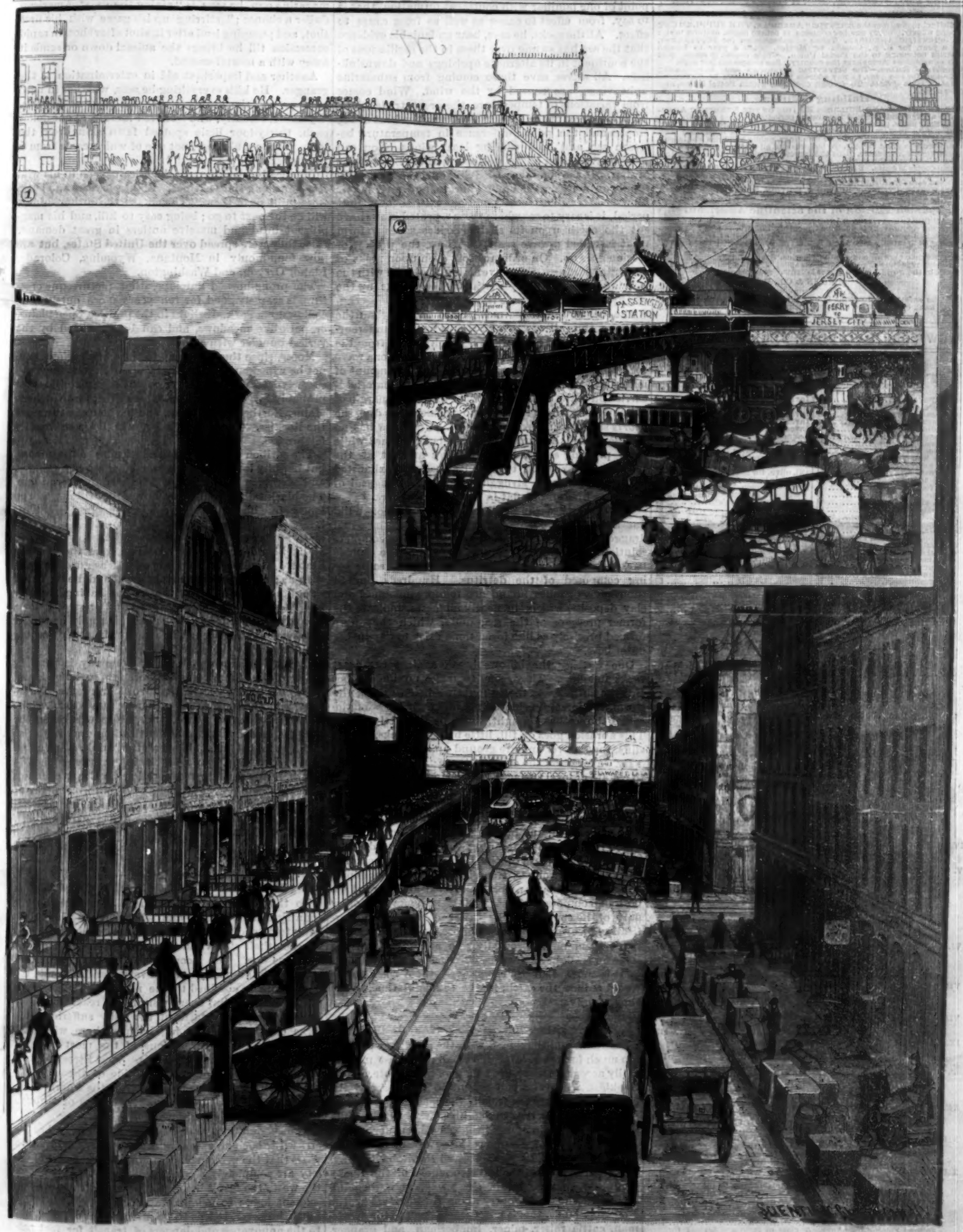
SCIENTIFIC AMERICAN

[Entered at the Post Office of New York, N. Y., as Second Class Matter. Copyrighted, 1890, by Munn & Co.]

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. LXII.—No. 6. ESTABLISHED 1845. NEW YORK, FEBRUARY 8, 1890. $3.00 A YEAR. WEEKLY.



PROPOSED PLAN OF BRIDGING OVERCROWDED STREETS OF NEW YORK CITY —[See page 87.]

Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

No. 361 BROADWAY, NEW YORK.

O. D. MUNN. A. E. BEACH.

TERMS FOR THE SCIENTIFIC AMERICAN.

One copy, one year, for the U. S., Canada or Mexico.......... $3 00
One copy, six months, for the U. S., Canada or Mexico.......... 1 50
One copy, one year, to any foreign country belonging to Postal Union, 4 00
Remit by postal or express money order, or by bank draft or check.
MUNN & CO., 361 Broadway, corner of Franklin Street, New York.

The Scientific American Supplement

is a distinct paper from the SCIENTIFIC AMERICAN. THE SUPPLEMENT is issued weekly. Every number contains 16 octavo pages, uniform in size with SCIENTIFIC AMERICAN. Terms of subscription for SUPPLEMENT, $5.00 a year, for U. S., Canada or Mexico. $6.00 a year to foreign countries belonging to the Postal Union. Single copies, 10 cents. Sold by all newsdealers throughout the country. See prospectus last page.

Combined Rates.—The SCIENTIFIC AMERICAN and SUPPLEMENT will be sent for one year, to any address in U. S., Canada or Mexico, on receipt of seven dollars. To foreign countries within Postal Union, nine dollars a year.

Building Edition.

THE ARCHITECTS AND BUILDERS EDITION OF THE SCIENTIFIC AMERICAN is a large and splendid illustrated periodical, issued monthly, containing floor plans, perspective views, and sheets of constructive details, pertaining to modern architecture. Each number is illustrated with beautiful plates, showing desirable dwellings, public buildings and architectural work in great variety. To builders and all who contemplate building this work is invaluable. Has the largest circulation of any architectural publication in the world.

Single copies 25 cents. By mail, to any part of the United States, Canada or Mexico, $2.50 a year. To foreign Postal Union countries, $3.00 a year. Combined rate for BUILDING EDITION with SCIENTIFIC AMERICAN, $5.00 a year; combined rate for BUILDING EDITION, SCIENTIFIC AMERICAN and SUPPLEMENT, $9.00 a year. To foreign countries, $11.50 a year.

Spanish Edition of the Scientific American.

LA AMERICA CIENTIFICA E INDUSTRIAL (Spanish trade edition of the SCIENTIFIC AMERICAN) is published monthly, uniform in size and typography with the SCIENTIFIC AMERICAN. Every number of *La America* is profusely illustrated. It is the finest scientific, industrial trade paper printed in the Spanish language. It circulates throughout Cuba, the West Indies, Mexico, Central and South America, Spain and Spanish possessions—wherever the Spanish language is spoken. $3.00 a year, post paid to any part of the world. Single copies 25 cents. See prospectus.

MUNN & CO., Publishers,
361 Broadway, New York.

☞ The safest way to remit is by postal order, express money order, draft or bank check. Make all remittances payable to order of MUNN & CO.

NEW YORK, SATURDAY, FEBRUARY 8, 1890.

Contents.

(Illustrated articles are marked with an asterisk.)

TABLE OF CONTENTS OF SCIENTIFIC AMERICAN SUPPLEMENT No. 736.

For the Week Ending February 8, 1890.

Price 10 cents. For sale by all newsdealers.

WAVE ACTION.

Waves and wave action form an interesting study. We see the billows curling toward the shore, then break, the sand and pebbles washing backward with them; who has not noted the rapid changes of the ocean beach? This storm tearing it away, and that one broadening it out; the gradual wearing away of islands along their seaward face, while, at the same time, making to leeward. What is the mean effect of wave action on the continents is a subject which, for the most part, has been treated by hydrographers like Admiral Davis, Lieutenant Maury, and Beautemps-Beaupre. Now comes a geologist, Prof. Shaler, who, in a recent paper, discusses the subject from the standpoint of one familiar with continent formation, that is to say, from effect to cause as well as from cause to effect. All the rocks, he says, bear undeniable evidence that the sea has swung over them in the oscillations of the continent in its alternate uprisings and downsinkings. All waves, save those coming from submarine upheavings, are caused by the wind. Wind comes from variations of temperature, the great trade winds being an effect of the disparity between the heat of the tropics and the poles; difference in temperature between sea and land causing local winds. You can study wave action on an ordinary pond. So says the author. If the shore be a shelving one, the waves will topple over, as do the ocean's surges, and strike their blows. After an artificial pond has existed for a short period, it is easy to see where these repeated blows have cut the earth upon its shelving sides, so as to form what is called a wave scarf, and how the process of erosion goes on. On ordinary soil, even upon rocks of moderate hardness, this wave action combined with the freezing which takes place in winter breaks up the earthy material and bears it outward.

The tops of the waves move more rapidly than the bottoms, thus all wave-swept shores have an undercurrent movement of their waters, which sets off from the coast line toward the deeper waters. Wherever a wave rolls up on a shore, it grinds up a certain amount of material. With the reflux of the surge this material is carried off to the edge of the deeper water, the margin of the surf belt, where the undertow comes in to drag the *debris* still further from the coast. Undertow has no influence near the surface, which sets shoreward while it is pressing seaward. Many lives are lost at the bathing beaches, he thinks, because the exhausted swimmer essays to struggle ashore afoot instead of throwing himself out flat in the surface waters.

Waves while scarfing a beach against the shore build out a shelf composed of all the material they had dragged from the land, save that gone into complete solution from grinding. By this he means the outside bar, with which every bather is familiar, the same being composed of the detritus. Hundreds, indeed thousands, of miles inland are found sandstones and clay deposits, which, in nearly all cases, indicate the former presence of the sea, under which they were formed precisely as like formations exist to-day in the outer bars.

One watches the billows break against the coast rocks and cliffs. They seem to make no impression. But the author says that, should we listen during the storm, the forceful grinding against their bases of the stones the sea has brought, could be distinctly heard. This abrasion goes on till, little by little, rocks, ledges, cliffs, topple over and are ground up.

By wave action the continents are gradually brought to a state of level surfaces, the waste being distributed into broad plains.

Thus, says Prof. Shaler, on the eastern shore of North America the waves are driving the shore inland to the westward, and building on the sea floor a plain, which is constantly extending to the eastward. The great southern plain of the United States, including parts of the Carolinas, Georgia, Alabama, Mississippi, and all of Florida, is a portion of such an emerged sea bottom, composed of material worn from the older parts of the continent. Rains act to cut the land vertically downward, the waves of oceans and of lakes to plane them off horizontally. In a general way the solar forces fight against the existence of all continents and islands. Left to themselves, these solar forces would reduce the earth, in the course of time, to the state of universal ocean.

EXTERMINATION OF AMERICAN GAME.

Railroads and the "man with the gun" are proving too much for game, large and small; the first making easily accessible what, not long ago, was remote, almost trackless, wilderness and mountain fastness, and the breech-loading gun, especially the magazine type, enabling the veriest tyro to find his mark. The last link in that great chain of rails that has been uncovering the haunts of hoofed game is the new transcontinental line, the St. Paul, Minneapolis, and Manitoba Railway, invading, as it does, the last stronghold of the Rocky Mountain goat, mountain sheep, elk, and woodland caribou. The wild country about St. Mary's Lake, the Kootenay lands, too, is now thrown open to the sportsman, cattle raiser, miner, lumberman, and granger. Happily in the Yellowstone Park are collected some herds of the noble game once roaming the broad continent in countless thousands. What remains is in sad need of protection from the pelt hunter and the wanton slayer.

In a recent paper, W. T. Hornaday, taxidermist at the Smithsonian Institution and for years a professional hunter for an animal collecting agency, computes the amount of game now remaining and discusses the prospects of its survival. He says the wildest trail of the old days is now scarce a fortnight's journey from Broadway. The man who used to content himself with a weapon scarcely more accurate than the blunderbuss can now buy a breech-loading rifle for $18, and a fine double-barreled breech-loading shotgun for $30. The magazine gun, he says, is "giving the great American duffer a chance;" stirring up his game with his first shot, and pumping lead after it, shot after shot, in rapid succession till he brings the animal down or sends it away with a mortal wound.

Another and important aid in extermination is the granger. He kills everything he sees, whether in need of it or not, the author meeting a man at Rawlins, Wyoming, recently, who "offered for sale, at one dollar each, thirty-four little spotted fawn skins from the young of the mule deer, not one of which came from a fawn over three weeks old."

Practically speaking, the American bison in his wild state was long since extinct. Eighteen years ago there were millions of them. The elk, so the author thinks, will be the next to go; being easy to kill, and his magnificent head and massive antlers in great demand. Once they were spread over the United States, but are now found only in Montana, Wyoming, Colorado, Idaho, Oregon, and Washington.

The prong-horned antelope, that picturesque creature, is scarcely good for ten years more outside Yellowstone Park. He lives in the prairies, open plains, or park-like meadows, and can be outwitted by the veriest bungler with a good gun.

Moose, since they range up to the arctic regions, cannot be wiped out, but in the United States they will scarcely last us twenty years, there remaining now probably less than 150 head, most of them in Northern Maine, Northern Minnesota, and in the main ranges of the Rockies. The head of a large bull moose readily fetches $75.

The caribou ranges the same latitudes as the moose, but happily loves the thick woods, the leafy tangles, and evergreen forests, and will be hard to exterminate. The black tail, or mule deer, our author thinks, will go long before his congener, the Virginia white tail. This latter does his own thinking, being keen-eyed and alert, and skulking in the thickest timber, will not, in all likelihood, ever be driven even from the Eastern States. The Rocky Mountain goat is as good as gone with us; all his haunts are known, and he is being slaughtered at wholesale, the author having recently bought seventy-five skins, tanned and dressed, from a Brooklyn tanner for $1.50 the pelt. Happily he ranges to Glacier Bay, Alaska. The mountain sheep, or big horn, is sharing the same fate.

The ancient Hudson Bay Fur Company is winding up its affairs, there being no more furs to be had, and an old fur buyer, recently returned from the Northwest, says the business of gathering furs is dead. The beaver has become scarce, trappers now seeking the once despised muskrat and even the little gray rabbit to make up for the lack of beaver, otter, mink, marten, and sable. Lynx and bear skins are in great demand. The Southern fur seal is gone, and Pacific Coast poachers are slaying indiscriminately; the California elephant seal is extinct; the walrus is rare; the great arctic sea-cow is gone, its congener, the manatee, a curiosity. Bears, particularly the grizzly, wolves, and foxes are fast going, and milliners' taxidermists are now slaughtering the singing birds in vast quantities.

BRIDGE OUR DOWNTOWN SIDE STREETS.

To the many thousands who have homes in the country near the city, and who come to New York daily to attend to business duties, the problem of how to reach their offices and the main arteries of traffic is a serious one. The inconvenience is formidable, and the dangers are many and at every hand. Nor is the inconvenience confined to the residents of New York and its suburbs, but every visitor who reaches this city by ferryboat has a taste of the daily sufferings of a large class of people doing business here who have daily to cross West Street, one of the most crowded thoroughfares of the metropolis. West Street borders the Hudson River on the west side of the city, and the immense commerce received from the wharfs of the Hudson River must be transported across or through this overtaxed thoroughfare.

The population and business of the city has increased to such an extent during the past ten or fifteen years that the principal streets in the lower part of the city are completely blocked three or four days out of the week, the result being very serious delays and consequent losses to merchants and others. It is not so much, however, to this that this article is directed, but to the annoyance and dangers of transit for foot passengers. The lower part of Manhattan Island is ap-

proximately V-shaped. The main arteries of traffic converge to certain points where the great business and commercial centers are located; the streets are narrow and are usually being torn up by the steam, gas, or electric supply companies, so that it becomes a simple arithmetical problem how many trucks and vans are required to cause the complete stoppage of traffic. This problem is being demonstrated almost every day by a complete blockade and stoppage of all transit, this being the proof of the question that the limit of taxation has been reached and passed. The fate of the poor foot passenger is that he must walk to the ferry house, as the cars usually are unable to run, and a cab, which can only be used by a limited class, is usually blocked before reaching the ferry house. This means splashing across a muddy street, with no small danger of being struck by a pole or being rolled over by an unruly horse, while the sidewalks are not much better, being always obstructed and almost blocked with cases, boxes, vegetable and fruit barrels, and crates.

It has been proposed to overcome these difficulties and dangers by building a raised passageway for foot passengers over the sidewalks from the ferry houses, across West Street, and along the various streets that lead to the ferry houses as far as the elevated railroad stations, and even as far as Broadway. The benefits of this would be incalculable. Plans have been prepared by the Pennsylvania Railroad Company for laying such a thoroughfare through Cortlandt Street to the Cortlandt Street ferry, and we have prepared drawings showing the proposed arrangement, which are published on our front page.

It is to be hoped that at no remote period this elevated pathway will be carried out, and it is with much pleasure that we learn that the first step to that end has been taken, as the Board of Street Opening and Improvement have granted to the Pennsylvania Railroad and the Central Railroad of New Jersey the privilege of erecting bridges over West Street. This is only, however, a partial cure of the evil, and every effort should be made to extend the system at least far enough to connect with the elevated railroad stations. A plan similar to the one represented on our initial page this week was illustrated in the SCIENTIFIC AMERICAN as long ago as June 28, 1884, but not until very recently have any measures been taken to carry out any plan for the relief of persons who live out of the city, and have to cross our downtown crowded streets. At first great opposition was offered to the granting of the privilege of building even a bridge over West Street, and it was claimed that the railroads should pay the city for the right conferred.

As it was demonstrated, however, that the proposed venture conferred no especial benefits upon the companies, and was of incalculable convenience to the public at large, these objections were waived, and the project is now fairly under way. Such structures should not only be put up in Cortlandt Street, but also in Liberty, Barclay, and Chambers Streets, and in case the railroad and ferry companies are not disposed to take hold of the matter, why should not the city do so, and thereby confer an immediate benefit upon the public? This could be done without imposing any burden upon the taxpayers, for the expense would not be very great and the increase in the value of real estate along the line of improvement would be so great that the improvement could be made to pay for itself either by direct assessment of the property or by renting the privileges of connecting the second stories of the buildings directly with the elevated thoroughfares, and thus convert these parts of the buildings, which now are practically valueless, into stores, shops, and restaurants.

Several of the ferry lines which have found that ten minute, and even seven and a half minute, boats are not able to handle the enormous crowds that cross the river daily, are having plans prepared for double-decked ferry boats which would complement the benefits of an elevated thoroughfare by enabling the passengers to pass directly from the upper deck of the boat to the footpath without being compelled to go to the street.

Patent Office Reform.

Congressman Butterworth's efforts toward reforming the Patent Office deserve immediate success. As he was once Commissioner of Patents, he is well qualified to judge of the needs of the bureau. It now occupies a small portion of the building which was erected out of the profits of running it, and is badly cramped.

Other bureaus of the government are run at a loss. The Patent Office alone makes a handsome profit to the government, yet it is in cramped quarters, has an insufficient force of examiners, which causes great delay and financial loss to inventors. In some branches the examiners are eighteen months behind their work. Some of the applications on file are for important inventions which are imperatively needed, but no application can be taken up out of order except by order of the Secretary of the Interior, for reasons of public necessity.

It should not be overlooked that one of the greatest elements of our national prosperity is the advantage we possess over every other nation by reason of improved machinery and mechanical devices, the products of American genius. Great as have been the achievements of the past, there was never a time when so many useful and convenient inventions were being brought out as at present, none of which can be introduced until covered by letters patent.

The Patent Office ought to be given all possible facilities for rapid and efficient administration. The inventors more than pay all expenses, and there is no justice in subjecting them to unnecessary delays. This is one of the most important subjects now before Congress, and should be dealt with promptly.

The *Philadelphia Inquirer*, from which paper the above is copied, is quite right in urging upon Congress the importance of taking immediate measures to relieve the overburdened Patent Office, and furnishing the whole bureau of employes more room and better facilities for carrying on the work. To this end, which is somewhat encouraging, the House committee on patents has been directed to investigate and report, by bill or otherwise—

First.—What change in existing patent laws is necessary to correct any alleged abuses and render the system more perfect and efficient.

Second.—Whether the Bureau of Patents has sufficient room and facility for the proper and prompt discharge of the business brought before it.

Third.—Whether the force employed is adequate and the compensation of examiners sufficient to secure and retain an efficient corps.

The Edinburgh Exhibition, 1890.

An international exhibition of electrical engineering, general inventions and industries will be opened this summer at Edinburgh. A large guarantee fund has been raised and all preliminary arrangements made. A large number of exhibits are to be forwarded from Paris, including the whole of the Edison collection. A site of ninety acres has been secured in a commanding situation near Merchiston, to the southwest of the city. There are to be two main buildings, one of which will be devoted entirely to the electrical exhibits and machinery in motion. The two buildings are connected by a covered way, crossing the railway by a substantial wooden bridge, and midway between an annex will probably be erected. The building for general exhibits, which is 700 feet by 200 feet, is approached from the main entrance by a handsome iron bridge crossing the Union Canal. The general character of the design of the main building is that of the French Renaissance, the towers being, as has become almost universal in exhibition buildings, somewhat Moorish. The engineer and architect-in-chief is Mr. W. Allan Carter, M. Inst. C.E., and his assistants are Mr. Frank W. Simon, architect, and Mr. Penman, C.E.

Thin Macadam Roads.

Mr. James Owen, county engineer of Essex County, N. J., under whose direction the admirable macadam roads about Orange have been built, sends the following communication on their construction to *The Engineering and Building Record.*

I obtained my early experience, says Mr. Owen, in the sixties, in the construction of park roads in Brooklyn, when the thickness of pavement was never less than sixteen inches, laid on a bed of 12 inches of sand, and was undoubtedly a Telford pavement. When, however, I had to initiate in New Jersey a more economical system, I decided on a depth of 12 inches, 8 inches of pavement and 4 inches of broken stone; between 30 and 40 miles were constructed of this depth in the avenues radiating from Newark through the Oranges and Montclair. They have stood the wear and tear for sixteen years admirably, of course with proper repairs, and in only two or three instances did the foundation ever blow up. These roads were county roads, and really main arteries, but when the local committees decided to build their own roads, the divergence of opinion and lack of crystallized sentiment led to the adoption of anything from 4 to 12 inches, and the result has been in the same ratio as the thickness. The Oranges, East, West and the city, have laid their roads 10 to 12 inches in thickness, and the uniformly good condition of their roads is proverbial. Bloomfield and Montclair have been building theirs 6 inches, and the difference is remarkable; ruts quickly appear, holes are common, and they look, as they are, cheap roads. In these cases, however, there was an attempt at a pavement. In other townships, like Clinton, Millburn and parts of South Orange, no attempt has been made further than to spread 4 to 6 inches of broken stone on the natural soil, and the result shows that it is to a certain extent a waste of money. The only advantage accruing in such a road is to keep the wagons from getting mired, but as means of travel they do not reach to a very high order.

In the red sandstone formation of New Jersey, in which all the roads mentioned are laid, there are critical periods, especially when the frost is coming out, when it seems absolutely necessary to have a foundation of some sort to keep the roads from breaking up, and only in specially favored localities is it possible to keep a 6 inch pavement without rutting unless there is a sharp fall to the roads. In the latest roads built in this section at Belleville I adopted a rule of making the thickness of pavement as follows: For grades flatter than 1 per cent, 10 inches; between 1 and 4 per cent, 8 inches; and over 4 per cent, 6 inches. This is the thinnest construction advisable in this locality with any certainty of good, permanent results, unless the roads are merely built as a preventive from miring instead of from travel.

In conclusion, I wish to deprecate as strongly as possible the idea of doing cheap work in road construction, as in my experience there is more money wasted in these attempts than is generally realized. A community, if educated to a proper standard, will prefer to spend a dollar well than fifty cents in makeshifts, and it should be the duty of every engineer to guide them to that end.

Fair Play for Inventors.

It is a habit far too common for railway officers and some railway papers to speak in a derisive way of any man who invents or offers a new device in the line of railway appliances, especially if he is not a practical railway man. He is dubbed a "crank," or a "coupler fiend," as the case may be. One who has devised and put into practice a very important device, and who has made a fortune by it, is commended and held in high honor, notwithstanding the fact that he may have patented a half dozen other devices that are as ridiculous as any of those of a real idiot. As the cap of a poor fool has been known to strike paizied an arm just raised to reap a crowning victory, so there is no doubt that this custom of ridiculing inventors has deterred many a man from bringing out some very useful device, for fear of becoming a butt for this class of ridicule. Very many of the most valuable railway appliances now in practical use have been devised by men having no practical experience in railway work, and had it not been for this class of inventors, very little progress would have yet been made in railway improvement.

Of late, however, more attention is being given by railroad men to experiment and invention, and many recent patents are in the name of prominent railroad men. This fact may tend to elevate the inventive fraternity in the estimation of railway officers. We say, all honor to the men who spend a dollar in money or an hour's time in an attempt to improve upon existing practices. We live in an age of universal ideas; there is a restless and persistent spirit of enterprise. Brilliant results have followed this practice of universal thinking; while there are a few idiosyncratic inventors and others whose devices are utterly worthless, there is no justice in this wholesale criticism. There are many inventions that fail at first on account of imperfections in secondary details, and the inventor may not be appreciated at the time. The defects may be remedied by some one who comes after him, and the device prove to be a great success. The last man receives the credit, which in fact belongs to the first, who in his day received only ridicule. This is a common occurrence, and shows to what unkindness and injustice this habit of ridicule may lead.—*American Journal of Railway Appliances.*

Peter Henderson.

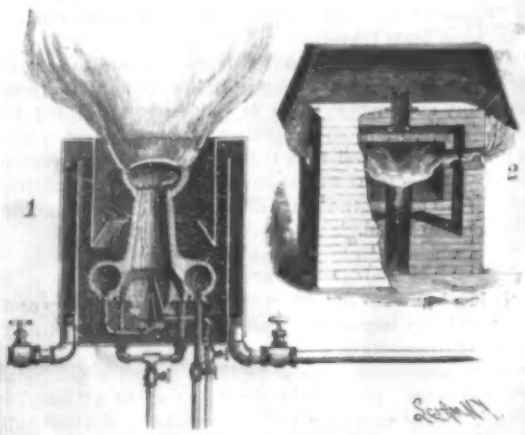
Peter Henderson, the florist and seedsman, died recently at his home in Jersey City, of pneumonia. The disease developed from the grip. He was 66 years old, and until within a few days ago he was in robust health. He leaves a wife, two sons, who were his partners in business, and one daughter. He was born in Castle Head, Scotland, in 1823. At the age of 16 he was apprenticed to a gardener. He became a careful student of botany, and a year later he received a gold medal offered by the Botanical Society of Edinburgh for the best scientifically arranged herbarium. He became a member of the Society for the Advancement of Horticultural Science, and prepared a paper for the London *Gardener's Gazette*, denouncing the then common practice of holding as secrets horticultural operations. In 1843 he came to this country. He worked for gardeners and florists until he had saved money enough to start in business for himself. That was in 1847. He bought land in Wayne, Monmouth, and Mercer Streets, in Jersey City, and started as a market gardener. Some time afterward he added a florist department, and then the seed business. His hothouses on Jersey City Heights now cover more than five acres, and it requires 100 men to take care of the flowers.

Mr. Henderson has written many books on horticulture. His first was "Gardening for Profit." It was published in 1866, and more than 125,000 copies have been sold. In 1868 he published "Practical Floriculture," and in 1875 "Gardening for Pleasure." His last book, "Handbook of Plants," was printed in 1881.

Mr. Henderson often remarked that he had never been sick a day in his life. He was a member of the New York Horticultural Society, the New York Florists' Club, the Society of American Florists, and the Seed Dealers' Association.

A BURNER FOR HEATED COMPRESSED AIR AND OILS, GASES, ETC.

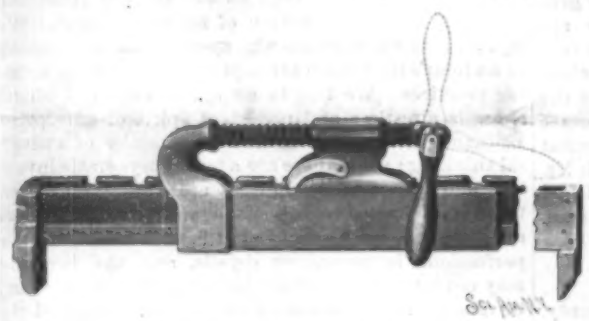
The accompanying illustration represents a burner for use with hydrocarbon oils, gases, etc., designed to be employed for all purposes where a steady, uniform heat is desired, of a high degree, and free from sulphur or other impurities. It has been patented by Messrs. David C. Andrews and James F. Seery, of



ANDREWS & SEERY'S HYDROCARBON BURNER.

New York City. Fig. 1 represents a vertical sectional elevation of the burner, and Fig. 2 illustrates its application in a heating or welding furnace. The lower portion of the body of the burner has a heating chamber of annular form, projecting upward from the inner walls of which is a tapered portion forming a mixing chamber, with a concaved cap piece, above which is held a superheating plate in such position as to provide an annular slit or opening, through which the mixed gases issue at the point of ignition of the burner. Into the lower end of a central hollow portion of the burner body is fitted a nozzle, within which is fitted a smaller inner nozzle, both discharging upward into the mixing chamber. Into the outer one of these nozzles opens a pipe from an oil reservoir, and into the inner nozzle opens a pipe from the annular heating chamber, another pipe from a compressed air reservoir discharging into the heating chamber. Another pipe is arranged to admit air or steam through diametrically opposite passages directly into the mixing chamber about on a level with the discharge end of the oil supply nozzle. This apparatus is inclosed in an open-topped casing or cylinder, to which is jointed an outer casing extending above the inner casing, whence the outer casing is carried inward and downward to about midway of the mixing chamber, around which the inner termination of the continuous wall of this outer chamber is bent up in cone shape. This forms a passage between the two casings, the only outlet from which is toward the point of ignition of the burner, air being supplied to this passage to be superheated therein on its way to the point of combustion. If desired, in the burning of light oils, the oil supply pipe may be connected directly with the heating chamber to vaporize the oil, whence it is discharged in that condition from the inner nozzle direct to the mixing chamber, to be there commingled with air supplied through the opposite side passages. It will be noticed that there are valves in all the pipes for the proper regulation of the supply of oil or gaseous fuel, steam, and air, as desired, according to the work to be done, which may include the generating of steam, heating of forges, welding, heating blanks for bolts, firing axles, chisels, etc. The system is claimed to be particularly adapted to fire machines, generating steam in a few minutes, requiring but little draught, dispensing with the use of nozzles, thereby increasing the efficiency of the engine; allowing the carriage of sufficient fuel, while the entire absence of coal dust, smoke, ashes, and cinders is a commendation.

For further information relative to this invention address Mr. D. C. Andrews, No. 24 State Street, New York City.



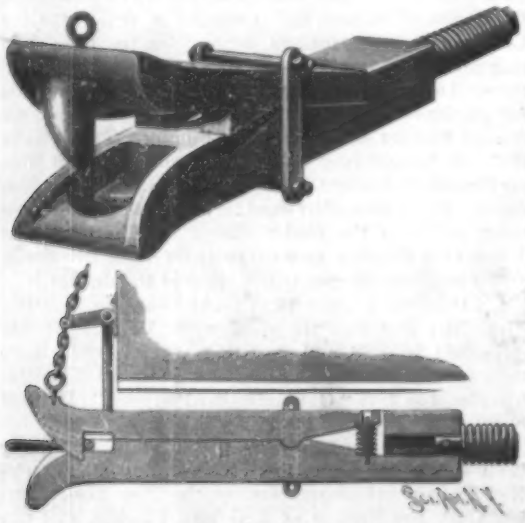
KELLS' EXTENSION CLAMP.

AN IMPROVED CLAMP.

The accompanying illustration represents a clamp especially adapted for use in connection with articles to be glued, cemented, or otherwise attached. It has been patented by Mr. Herbert Kells, of No. 95 Fulton Street, Astoria, N. Y. The body of the clamp consists of two spaced side pieces united at one end by a block forming an end bearing surface, the side pieces being united at the other end by a fixed head block having its upper end curved. Near the center of the inner faces of the side pieces is a longitudinal rib, in which fit grooves of the inner or sliding section of the clamp, which may consist of a strip of wood or metal of slightly greater width than the side pieces, there being another bearing block at the outer end of this sliding section. Upon the head block is pivoted a latch, and the straining device consists of a screw with a ball at one end entering a cavity in the upper curved end of the fixed head, while at the other end is a pivoted handle, instead of a winged head, the full and dotted lines in which the handle is shown indicating the facility with which the screw may thereby be turned. This clamp is designed to afford a perfectly straight contact surface, whereby, in panel work, etc., the extra piece of wood or metal heretofore employed to true up the work is dispensed with.

AN IMPROVED CAR COUPLING.

A car coupling designed to automatically couple cars of different heights, and permit the detachment of coupled cars from the roof or sides of the car, as desired, is shown in the accompanying illustration, and has been patented by Messrs. Charles S. Monroe and Clinton E. Yeager, of Kinzie, Ind. The coupling is shown in perspective and sectional elevation. The coupling jaw is seated, by means of a transverse rib, on the top of the main section of the drawhead, where it is held in a rocking bearing by a clamp. An integral draught hook is formed on the front end of the coupling jaw, and a spiral spring is arranged to bear on the under side of its rear end, to retain the jaw normally in closed adjustment, as shown in the sectional view, while allowing it to yield to a longitudinal thrusting movement of the entering coupling link, the pressure of the spring then causing an interlocking of the parts. A cushioning spring is placed on the draught rod, received in the rear end of the drawhead, to sustain the shocks received thereby. Across the end of the car a rock shaft is revolubly supported in bracket boxes, with crank arms, whereby the shaft may be rocked at either side of the car, a rock arm on the shaft being connected by a chain with a ring on the outer end of the coupling jaw. This chain is also extended to the roof of the car, to facilitate the elevation of the coupling jaw when uncoupling is to be effected from that point.



MONROE & YEAGER'S CAR COUPLING.

OIL and gas have been discovered in Johnstown, Fulton County, N. Y., and the most flattering prospects for these industries have dawned upon this quiet locality.

Albumen Paper for Blue Prints.

Very pretty effects may be produced by printing on ordinary albumen paper sensitized with the following solution:

Citrate of iron and ammonia	3¼ drachms.
Dissolved in water	2 ounces.
Red prussiate of potash	2½ drachms.
Dissolved in water	2 ounces.

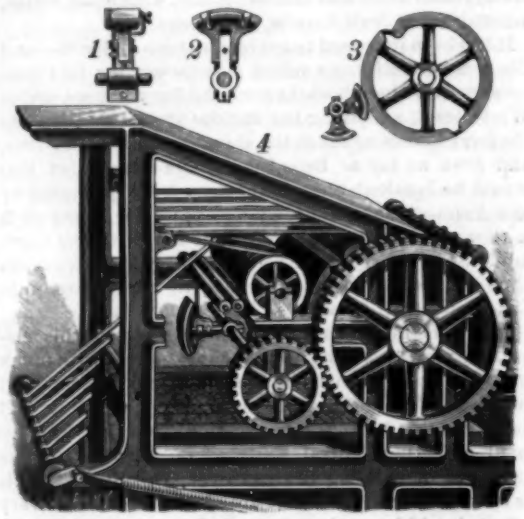
Mix equal parts just before using, as the mixed solution will not keep, and float the paper as on the silver bath, film down, for half a minute or so, and suspend by one corner in a dark room to dry.

Detail can be brought out almost equal to silver prints, while the ease of working and the cheapness make it quite desirable. The prints can be mounted and burnished.

Do not try to keep the paper sensitized, but make up fresh when wanted.—J. T. M.

AN ATTACHMENT FOR PRINTING PRESSES.

An attachment for cylinder presses, to facilitate the printing of additional matter in a color different from that in which the body of the sheet is printed, is represented in the accompanying illustration. It has been patented by Mr. Allen Ditson, of Larned, Kansas. On the outer end of the shaft of the main cylinder is a gear wheel meshing into a gear wheel on a shaft held to turn in suitable bearings secured to the main frame, the latter shaft being here shown to the rear of the main cylinder and directly under the fly. This latter shaft carries one or more adjustable attachments, each of which is formed as a cylinder or a segment of a cylinder, adapted to hold the type or plates to be used in printing the desired matter, which may vary from a single line to one or more columns. Figs. 1 and 2 represent side and end elevations of such a cylinder segment, Fig. 3 being a



DITSON'S PRINTING PRESS ATTACHMENT.

sectional view through the attachment and the main cylinder. Each printing attachment, when made in the form shown, may be clamped on the shaft in such place and position as desired, the shaft being preferably geared to make two revolutions to one of the main cylinder. The type or plate on the printing attachment receives its ink from rollers and a fountain arranged to operate independently of the rollers which ink the form on the bed of the press, the distribution being effected by a lever engaging a cam groove in the gear wheel which operates the attachment.

Olive Oil for Snake Bites.

Dr. C. R. Earley, M.D., Ridgway, Pa., uses olive oil with invariable success as a cure for rattlesnake poison. It is given in doses of a tablespoonful. Half a dozen doses, at frequent intervals, is sufficient. The doctor has treated many cases, always successfully. In these days of olive oil adulteration, care should be taken to secure the pure article.

AN IMPROVED STOVE PIPE.

A pipe adapted to be conveniently and rapidly put together and easily opened, for cleaning or other purposes without removing the pipe, is illustrated here-

TURNER'S IMPROVED STOVE PIPE.

with, and has been patented by Mr. James E. Turner, of Delaware, Ohio. The edges of the seam or joint of the pipe are formed with flanges adapted to receive a break joint plate, as shown in Fig. 2, for covering the sides of the pipe section. The plate has notches fitting on to rivets or pins secured to the sides of the pipe section, and on the outer end of each rivet is a hook adapted to engage the opposite rivet or pin, as shown in Figs. 1 and 3. By disconnecting the hooks the pipe may be sufficiently opened, while in place on the stove to afford facility for cleaning.

THE ARMSTRONG 9-INCH GUN.

The 9-inch gun mounting herewith illustrated, and which will serve as an example of the type generally known as a carriage and slide in the British service, is intended to be fired over a 6 ft. parapet or from a gun pit. Our engraving and the following description are from *Engineering*.

As the platform or slide is mounted on a ring of live rollers, an all-around fire can be obtained, while the area of the gun pit exposed to shell fire is a circle of less than 20 ft. in diameter, and from this must be deducted the area of a circle 12 ft. in diameter, occupied by the concrete foundation, which forms a solid block about 2 ft. 6 in. high in the center of the pit. It will thus be seen that a very small space is exposed to the enemy's fire, and even this is protected by the 6 ft. parapet.

Many eminent officers object to a completely inclosed emplacement, on account of its liability to act as a trap for well-directed shells. The parapet, however, need not be continued all around, as the rear may be left open to allow of the exit of the projectile.

A special feature in the gun is its capability of firing at night. For this purpose the ordinary day sights are fitted with an ingenious and easily attached contrivance, which will be hereafter described. For the present it will be sufficient to say that the ordinary sights are illuminated by a small incandescent lamp, the rays from which, passing through a lens, are converged, so that only a minute point or line of light, just sufficient to distinguish the sight, is obtained. By means of an adjustable resistance, the light can be modulated to suit the degree of darkness of the night or the eye of the observer.

The carriage admits of 15 deg. elevation and 7 deg. depression being given to the gun. This allows objects quite close to the gun to be hit, and also of a range of about 8,500 yards being attained. The penetrating power of the projectile, even at this great range, is at least 4¼ in. of iron, which is quite as much as some of the older classed, but still serviceable, ironclads carry on their sides.

At the rear of the slide a platform is fitted for working the gun, from which, after the loading operation is complete, one man is able to elevate, traverse, and fire the gun without further assistance. The mass to be revolved is over eleven tons, and it will therefore be seen that this is a considerable achievement in design; one great advantage being that it enables the man in charge to see his object, and to correct the laying up to the moment of firing.

There is an electric firing key, in the form of a pistol, which is held in the hand, so that no delay is occasioned by looking for the firing key. The firing battery is placed, as shown, so as to be well out of the way, but yet always handy for inspection. A metal arc is let into the stone coping around the top of the concrete foundation. This arc is graduated in degrees, and a pointer on the platform indicates the exact position of the gun, so that the latter can be elevated and traversed by signals from a distant observing station. Both operations can be carried out from the floor of the emplacement, and therefore under cover of the parapet.

The carriage is a compact structure of steel, each side consisting of a pair of steel plates, between which is interposed a cast steel skeleton bracket. The three parts are firmly riveted together. The two sides are connected by transoms of steel plate and angles and a bottom plate of the same material. There is a curved shield attached to the top of the carriage brackets. It is made from 1¼ in. steel plate. This gives ample cover both to the vulnerable portions of the carriage and also to the men who may be employed in loading or in laying and firing.

Permanent rollers are fitted to the carriage to allow it to run up after firing into the firing position. The carriage is kept from jumping by strong steel clips under the platform.

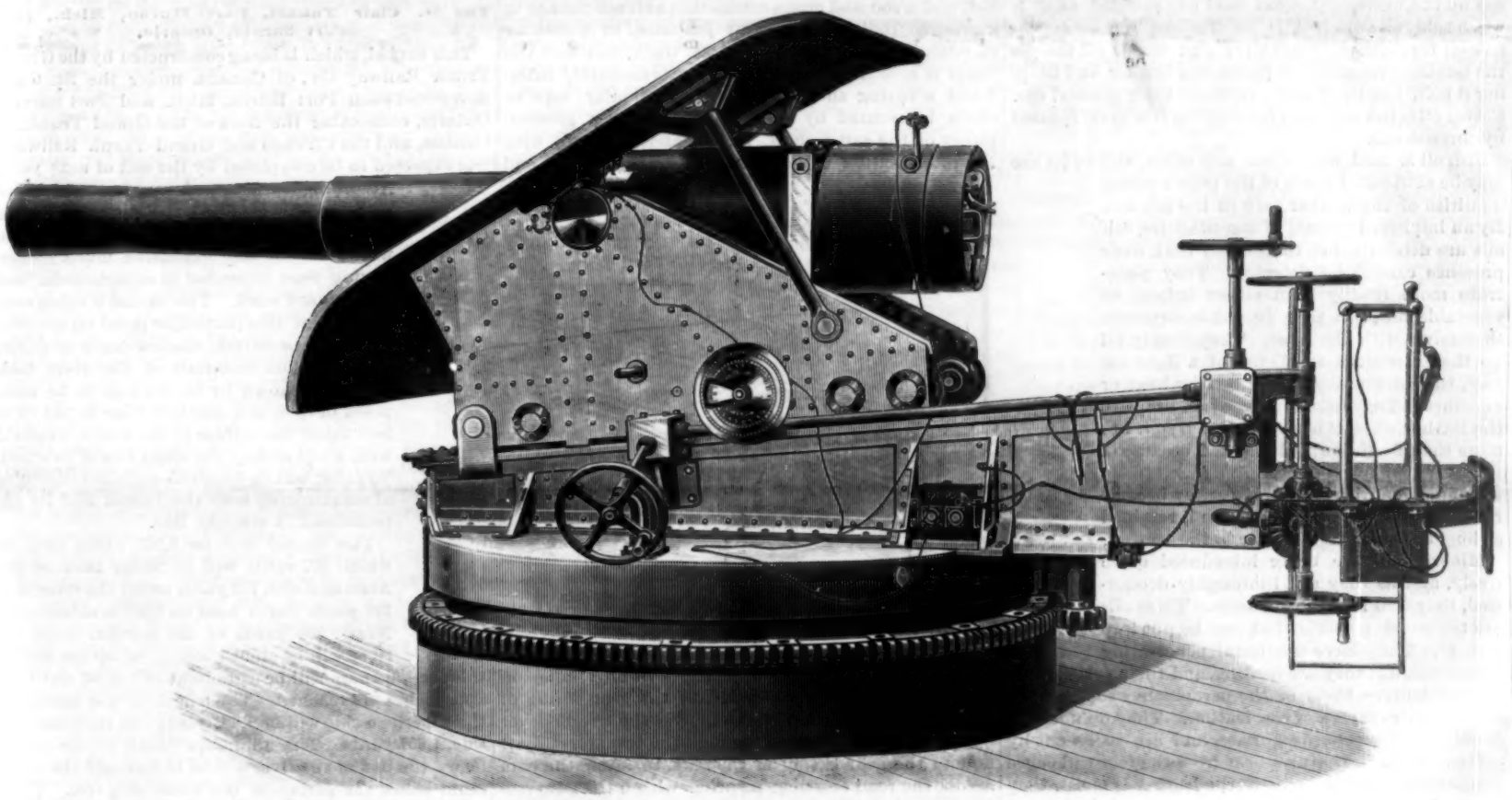
The platform also is of simple construction, consisting of two strongly built up girders of steel connected by transoms. On the upper surfaces of the girders the carriage rests, and to the lower surfaces is attached the upper roller path. The lower roller path is a single steel casting which is firmly bedded into the concrete foundation, and is also secured by twenty large anchor bolts. The slide is secured to the path by clips similar to those attaching the carriage to the slide. Around the outside of this path is attached a toothed rack into which a pinion works. This pinion is actuated through simple bevel gearing by the rear handwheels, so that the gun can be traversed directly from the platform in rear, or from the floor of the emplacement.

Between the upper and lower roller paths a ring of live rollers works. This enables the carriage and slide to traverse almost without friction, and this accounts for the ease with which it can be manipulated. The rollers can be taken out and examined with a very small amount of labor; and, as they are well covered, very little grit or dirt finds its way in.

It has been already stated that the gun can be elevated from the platform at the rear of the slide. This is effected by a shaft running parallel with the top of the slide, along which shaft a worm slides during recoil. The worm gears into a wormwheel, on the spindle of which is a pinion engaging the toothed arc fixed to the gun. The wormwheel is not attached directly to the pinion spindle, but to the friction disks compressed by a screw on the end of the spindle, so that when the gun is fired this portion of the gear may be allowed to slip without any undue strain on the worm.

The carriage is fitted with a single forged steel Vavasseur recoil cylinder, which is bolted to the bottom plate. The piston rod is fixed to the front of the slide. The piston is fitted with a rotating valve with two ribs, which slide in rifle grooves cut in the cylinder; ports are cut in the piston, and corresponding ones cut in the rotating valves. The cylinder is filled with oil, and the ports are shaped to give a uniform velocity of the liquid through the ports, and therefore a uniform pressure within the cylinder during recoil.

After the gun is fired it can be kept back, with its carriage, at the rear of the slide, by an automatic pawl, fitted to the right side of the slide. This pawl is released by the simple movement of a lever, and the gun is thus allowed to run out into the firing position. This arrangement is not generally used, as the gun is loaded when run out; but it is useful for getting to the front portion of the slide when necessary.



ARMSTRONG 9·2 INCH GUN MOUNTED.

Danger of High Pressure Electric Lights.

A recent number of the Boston *Globe* says:

As Patrolman S. Good was patrolling his beat on Washington Street last evening he passed close to the curbstone opposite the building numbered 731, and as he did so he experienced an electric shock. As he advanced nearer the building to investigate he experienced another shock, and the nearer he approached the stronger the electricity seemed to be.

The officer was puzzled as to the cause of the strange demonstrations, and while he was making an examination a large crowd, almost blocking the street, collected. He then rapped for assistance, and Patrolman Moore and Sergeant Boston responded.

The crowd, with much difficulty, was held back from the spot, but, notwithstanding this, several advanced near enough to receive a portion of the electric fluid that appeared to be playing hide and seek over the entire front of the building. While the officers were awaiting the arrival of an electrician, to ascertain the difficulty, a homely-looking black dog came along and touched the side of the building. He gave a loud yelp and in an instant his entire body was enveloped in a blue flame and the animal fell dead. No one would touch the body, and it continued to burn almost to a crisp. The cause of the difficulty was a wire attached to an arc light, which became loose and charged the iron work in the front of the building. The capacity of the current was 1,000 volts, and one of the electric light employes who arrived later to remove the dangerous obstruction said that had any one brushed against the walls of the building, it would have been sure death. The entire sidewalk was charged with the current, extending to the curbstone. The obstruction remained for almost an hour before the current was turned off.

Natural Gas at Findlay, Ohio.

A Findlay letter to *Light, Heat, and Power* says:

All the week people have been going out to the Hudson farm, between Stuartsville and Van Buren, to see the great gas well which the Northwestern Gas Company brought in early in the week. There is no sort of doubt but what it is the greatest well yet struck in Northwestern Ohio. The pressure is tremendous and yield enormous. The gauge shows over 35,000,000 feet of gas per day, and the roar of the escaping gas is deafening. The Findlay Gas Trustees, who own all the surrounding leases, are erecting a derrick on the tract immediately adjoining on the south, and expect that they will also strike it rich; but if they do, it will be something remarkable, for it is rare indeed that two great wells are struck in the same neighborhood.

Prof. Orton's recent prediction that nine years from now will see the total extinction of gas in Northwestern Ohio is laughed at by operators here. Even if the old wells should fail after four or five years' service, new wells are continually being drilled, and the city of Findlay alone has territory enough to supply, at the present rate of consumption, a population of 40,000 inhabitants for twenty years.

Shoe Leather Oils.

Animal oils and greases incorporate themselves with the fiber; they do not evaporate. Their action is like that of compounding various metals—instead of forming a composition, in the one case, all the elements are so compounded that their individuality is lost, and separation is almost impossible; in the other, the elements are mixed, but can be separated almost without loss in bulk. Moisture will drive the grease to the surface, and gradually the interior will be robbed of its life, but there is no evaporation. Consequently the leather retains its flexibility much longer than when the grease is also drawn out by heat and the action of the air.

Animal oil does not penetrate the leather so quickly as oils that are more volatile, but this very quality is what makes them more valuable, as they are taken up by the fiber, not simply sucked in and filling around it, and they are equally difficult to draw out. Rancid oils, oils that have undergone a chemical change that marks the first step toward vitiation, have lost their most valuable properties, and the process of decay which has begun introduces gases, creating the volatile element which so quickly robs the leather of its nourishment. At the same time the fiber is injured by the decaying grease.

Vegetable oils rank next to animal in their preservative qualities, but the oils extracted from flax seed and cotton seed, unless purified, are of such gummy nature and so easily affected by heat that they are unfit for use by the currier. Cotton seed oil, purified as it is when sold for sweet oil, is an excellent but an expensive oil for leather. Pure olive and castor oil possess the qualities requisite for preserving leather and keeping it soft, but their cost precludes their general use. Castor oil is the best, and for reoiling it is not surpassed by animal oils.

Fish oil is used more than any other, and to its use may be attributed much of the poor wearing qualities of the leather now in the market. By an improved process of manufacture, fish oils are deodorized so thoroughly that their presence cannot be detected. They penetrate more readily than either animal or vegetable oils, but they do not incorporate themselves with the fiber. They simply fill up the interstices, and being of a light nature, they are easily drawn out by heat or moisture. They impart a soft condition to the leather when it is new, as much so if not more than do the animal oils, and because of that, they are not condemned. If used freely in connection with hard grease, they become rancid, and impart an odor which is retained as long as there is any grease in the leather.

Mineral oils are being introduced quite freely, and as they are thoroughly deodorized, they find ready purchasers. These oils are the worst possible that can be put into leather. They have wonderful penetrating properties, but they are heating, and their volatile properties deprive them of the permanency so necessary for the preservation of the leather. They do not take kindly to other oils or greases, and are easily cut by water. While the natural heat from the feet will cause evaporation, particularly if the leather is moist, they do not become rancid, but they are more injurious to the fiber than even the most rancid animal oil.

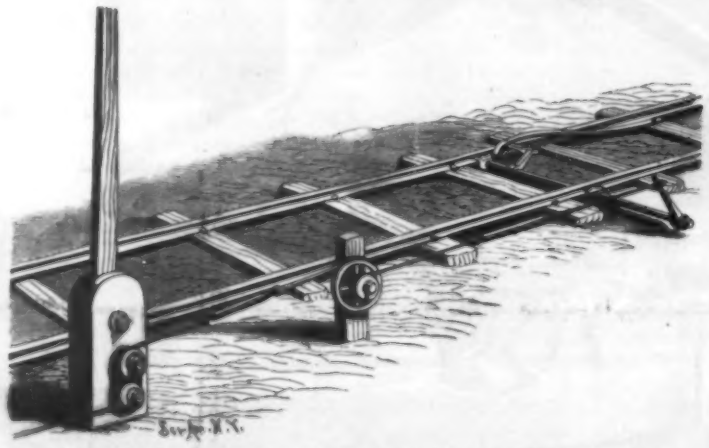
The shoe manufacturer should condemn all leather treated with mineral oils. A little care on his part will enable him to determine the oil used, whether animal, vegetable, or mineral. Good grain and clear fleshed stock invite the eye, and if properly treated with oils the leather will prove acceptable, but grease is the life of the leather, and just in proportion as the grease is pure and incorporates itself with the fiber is the leather durable or otherwise.—"*Boots and Shoes*" *Weekly*.

Shop Notes.

In the shops of the Manhattan Elevated Railway, New York City, work is produced at a minimum cost by a judicious use of jigs, templates, special appliances, etc. In turning bolts, says the *Master Mechanic*, they use two sets of gauges, one set of standard finished sizes and the other set of slightly larger dimensions. The latter is used for all work which must afterward be hardened and ground, and the former is used for all work not hardened and for grinding hardened work to finished sizes. Connecting and parallel rods are milled on both heads and bodies, instead of planed, the only planing being the finishing cut on the end of the main rod after the parts have been fitted together for the reception of the box. Guides are forged out of scrap iron and are finished by milling. They are casehardened and afterward ground. The standard crosshead on this road used to be built up from a number of pieces, nearly all of which were wrought iron or steel. Their standard is now of cast steel, which is much cheaper and reduces the number of parts. They are using cast steel and pressed steel to quite an extent in the place of cast and malleable iron. The boiler fronts are now made of pressed steel, and their appearance is very neat. An engine has just been equipped with the Woolf valve gear, a design which only needs two eccentrics per locomotive and in which the link is supplanted by a block sliding in a movable guide. The road has had no experience with this gear, but several roads in the Northwest have engines equipped with it, and good results are obtained.

IMPROVED GATE FOR RAILWAY CROSSINGS.

A gate designed to be operated by an approaching locomotive and train of cars, to prevent travel over the road crossing until after the cars have passed by, is shown in the accompanying illustration, and has been patented by Mr. Abram B. Anthony, of No. 19 North College Street, Schenectady, N. Y. At a proper distance from the road crossing a transverse shaft is journaled in bearings clipped to the base flanges of the rails. An arm is secured to this shaft near the inner side of one rail, and the outer end of the arm is pivoted to a forked link which is loosely connected at its other end to a treadle lever rigidly fastened to one of the cross ties. This treadle lever is preferably a steel plate, sufficiently elastic to be normally retained above the face of the rail near which it is placed, while it will be depressed by the flanges of the locomotive and car wheels passing over it. Upon the extremity of the transverse shaft a rock arm is secured, projecting in an inclined position opposite to that of the arm secured on the same shaft near the inner side of one of the track rails. On the end of the rock arm is pivoted a rod, and a rod and chain connection extends thence to a grooved pulley on a shaft journaled in a post or standard located at one side of the track, to which the chain is attached, there being intermediately interposed a spring shock absorber. A similar rope or chain is secured by one end to a larger grooved pulley on the same shaft, and extends forward, with the interposition of another shock arrester, the end of the chain being secured in a groove of a pulley on a shaft journaled transversely in the gear casing of the gate. The passage of a train over the treadle lever operates its connections, through the transverse shaft and to the gear casing of the gate, to lower the gate across the road crossing, a spring within the gate casing restoring the gate to vertical position after the train has passed. The spring shock arresters are designed to prevent too much vibration of the gate bar, and absorb any shock liable to injure the gearing of the device.



ANTHONY'S AUTOMATIC GATE FOR RAILWAY CROSSINGS.

The Influx of Foreign Capital.

About eighteen months ago, investments of foreign capital, particularly that of British capital, began to be made in American commercial enterprises.

This investment was suggested and stimulated by the organization of a corporation which "syndicated" the sale of the Sir Edwin Guinness ale and stout breweries, of Scotland. The surplus capital of the world's metropolis having turned such a quick penny in this speculation, immediately sought for a new field, and naturally attention was directed to this country. A thorough system of exploitation began. London and other large English municipalities have a body of highly trained and skillful men called "chartered accountants," whose reports are accepted with implicit faith by all financial institutions in England. The task which these men had to perform was to verify the book accounts of the various institutions, take an inventory of the plants examined, and substantiate statements made in regard to business. The work of investing in American enterprises in a short time became a regular organized business. A large number of properties have been examined by these chartered accountants, and negotiated through the brokers of various syndicates. It is not one but many different organized financial associations which have taken up these properties and "floated" or "placed" them.

The result, the editor of the *Architecture and Building* believes, will be highly beneficial to the industrial interests of the country, provided the venders keep good faith with the vendees. This provision is necessary, because the system pursued generally is to buy any given property outright, and retain some one who has been prominently connected with the business to superintend its continuance under a salary. Thus the business is conducted by experienced hands. The idea involved in the purchase on the part of the vendee is that for himself and his associates he can command a business which will pay as an investment much more than the paltry two or three per cent which the same money will command at home. The investments taken are generally sound, substantial, thoroughly established business ventures, and the direct consequence of this influx of foreign capital, so far, has been highly beneficial. The ultimate tendency, we believe, will be to secure further investment in enterprises that need additional capital to promote further progress. We do not believe in the alleged statements of the opponents of these investments, that the ultimate outcome will be a drain on our resources to enrich a foreign bondholder, for whenever that point is reached that his interests are greater in this country than in the land of his nativity, it has generally resulted in the moving to that country of the foreign bondholder. It is a monstrous and pernicious doctrine to uphold that the foreign bondholder has been a drain upon this country's resources. On the contrary, we owe to him the means by which our resources have been brought to their present great development, and his coming should be encouraged rather than impeded.

The St. Clair Tunnel, Port Huron, Mich., and Port Sarnia, Ontario.

This tunnel, which is being constructed by the Grand Trunk Railway Co., of Canada, under the St. Clair River—between Port Huron, Mich., and Port Sarnia, Ontario, connecting the lines of the Grand Trunk, of Canada, and the Chicago and Grand Trunk Railways—is expected to be completed by the end of next year.

According to a consular report which we have recently received, the progress during the last two years has been slow, and the work difficult and expensive, much money having been expended in experimental and preliminary work. The tunnel is being constructed at this particular point on account of the comparatively shallow depth of water, the favorable materials of the river bed, which are shown by the borings to be composed of rock at a depth of from 90 feet to 95 feet below the surface of the water, overlaid with a bed of clay, the short line of new railway that will be required, and the possibility of constructing both the tunnel and its approaches in a straight line.

The tunnel will be 2,267 yards long, of which 777 yards will be under land on the American side, 770 yards under the river, and 720 yards under land on the Canadian side. Nearly 500 yards of the portion under the river will be almost level. At either end of this section there will be a gradient of 1 in 50, until the approaches are reached. The length of the ascent on the American side will be 1,633 yards; on the Canadian side, 1,657 yards. The minimum depth of the tunnel below the bed of the river will be 15 feet, and the maximum below the surface of the water 66½ feet. There will be but a single line of rails. The cross section will be circular, and the clear internal diameter 20 feet. The lining will consist of cast iron. The total cost is estimated at £517,500, of which the Dominion government has granted the company a subsidy of £77,625. The advantages to be gained by the construction of the tunnel are a reduction in the expense of transporting trains and a degree of regularity in the service not obtainable by ferry, through the river being obstructed by ice in winter and by vessels during the season of navigation. According to the United States consul at Port Sarnia, the tonnage passing up and down is estimated to be nearly five times as much as that passing through the Suez Canal, and the necessity for a tunnel is shown by the enormous amount of traffic annually carried across the river St. Clair in connection with the Grand Trunk Railway. During the year ending June 30, 1889, 184,000 through and 13,500 local cars were transferred by ferrying; an average of 534 a day, or 23·6 per hour, which is equivalent to the crossing of a boat load of cars every forty-eight minutes.

DANIEL DRAWBAUGH, with some of his friends and neighbors, was in Harrisburg recently, giving testimony before M. Ott, the examiner, in the suit of the United States against the Bell Telephone Company. This testimony is intended to substantiate the two charges that Alexander Graham Bell has no right to the telephone patent, because it was obtained by fraud in the Patent Office, and, even if it were obtained without fraud, he has no right to it because Daniel Drawbaugh was the prior inventor. Among those whose testimony was taken was James Brooks, of Shiremanstown, Cumberland County, Pa., which is near Drawbaugh's home. He swore that he used the telephone in Drawbaugh's workshop between 1873 and 1874, before Bell had even announced such an invention.

BRIDGING NEW YORK STREETS.

West Street runs along the Hudson River front of the city of New York. Over eighty years ago its width was assigned it as 70 feet. Since then, within a comparatively recent period, an act has been passed by the legislature to widen it, and the bulkhead line has been carried out into the river in many places, so that it there forms a very wide thoroughfare. At several points the street is crossed daily by an immense number of people. These points mark the location of important downtown ferries, such as the one operated in connection with the New Jersey Central, the Pennsylvania, the Erie, and the Delaware, Lackawanna and Western Railroads. Another point is at the foot of Rector Street. At Pier 8, situated at the foot of this street, large steamers running between New York and Sandy Hook in connection with the Central Railroad of New Jersey make their landing, receiving or discharging at each trip, in the height of the season, several thousand passengers.

To provide relief for such cases as these an act was passed in the year 1889, by the legislature of the State of New York, which is embodied in Chapter 347 of the laws of that year. This gives power to the Board of Street Opening and Improvement to authorize the construction of bridges over streets of New York. Under this act permission was applied for by the Pennsylvania and New Jersey Central Railroads to erect bridges. The petitions were taken into consideration by the Board of Street Opening and Improvement, consisting of the following city officials, *ex-officio* members: the Mayor, Comptroller, Commissioner of Public Works, President of Public Parks, and President of the Board of Aldermen. Resolutions authorizing the construction of two bridges have now been passed by them. One is to be erected by the Central Railroad of New Jersey, and is to cross from the northeast corner of Rector and West Streets to Pier 8. This is to accommodate the Long Branch passengers. The other is for a bridge to cross from the southeast corner of West and Cortlandt Streets to the ferry house of the Jersey City Ferry. This bridge is to be built by the Pennsylvania Railroad.

As passed, the resolutions call for substantially the same bridge in each case, except as regards the span and width. The Central Railroad's bridge is to have 81 feet clear span, without support or stairs of any kind within that limit, and its width is to be 8 feet. The Pennsylvania Railroad bridge is to have a clear span of 100 feet and is to be 13 feet wide. The other requirements apply to both bridges. In general they are as follows:

The plans and specifications are to be approved by the Board of Street Opening and Improvement. The bridges are to be for the use of pedestrians only, and calculated to sustain a moving load of 100 pounds to the square foot. The trusses are to be 8 feet or more in depth. Sixteen feet clear head room is to be provided beneath them. A 4½ foot guard rail is to run on both sides to prevent accidents. No part of the structure is to be built upon the sidewalk. While the main structure comes under the jurisdiction of the Commissioner of Public Works, the Department of Docks, in consequence of the widening of West Street already alluded to, is named in the resolution as having cognizance of the western portion. Proper drainage of the structures is to be provided for, and the bridge is to be roofed. To cover all contingencies a bond of $25,000 is to be filed by the company constructing the bridge. The city is to be held harmless in the event of damage or injury from constructing or operation of the bridge. The permit is revocable at the pleasure of the board, and if they so direct, the structure must be removed at the expense of the railroad within thirty days. No news stand or similar structure and no advertising signs are allowed where the bridge extends over the public street. Their use is to be absolutely free to the public, who are to have full access at both ends. The eastern ends of both bridges enter buildings situated on the corners named. Within these buildings the stairs will be constructed.

The Pennsylvania Railroad Company contemplates running double deck ferry boats. These, in connection with the elevated road over which its cars are soon to run in Jersey City, will afford its passengers a practically independent mode of communication. It is proposed, when the time comes, to lift up the ferry house on the New York side, raising it bodily 14 feet, and to build adequate supports beneath it. The present waiting rooms and ticket offices will then be on the level of the bridge and upper decks of the ferry boats.

We illustrate on our front page what the Pennsylvania Railroad Company designed doing in furtherance of this idea. Recognizing the fact that a great many passengers came by the elevated railroads, they prepared plans in continuation of the bridge, carrying an elevated sidewalk up the south side of Cortlandt Street to connect with the elevated railroad system. Were this carried out, passengers could take the elevated railroad cars uptown and be placed on board the cars in Jersey City without ever touching the ground. For the present, at least, this plan will not be carried out.

One of the proposed arrangements was to construct an arcade through the buildings lying between West and Washington Streets, or perhaps Greenwich Street, which arcade would naturally be filled by stores and stands of various descriptions. This, however, has probably been abandoned.

Our views showing the proposed plans were prepared from detail drawings furnished us by the officials of the Pennsylvania Railroad Company.

Natural History Notes.

Temperature of Trees. — From some observations recorded by Mr. H. L. Russel in the *Botanical Gazette*, it appears that, as a general rule, the temperature of the interior of a tree is somewhat higher than that of the air, except during the warmer parts of the day, the maximum temperature of the air being generally between 1 and 2 P. M., and the minimum between 6 and 7 A. M. The comparative tables show that heat is absorbed and radiated more rapidly in the outer layers than in the center.

Experiments made at a time when the buds were starting, in order to determine whether the chemical action carried on in the tissues gives rise to heat, led to the conclusion that it is very doubtful whether the metabolic processes involved generate enough heat to influence the ordinary thermometer. A curious difference, however, was discovered in the wood of the oak and pine in winter, the author having found that the temperature of the pine was lower than that of the oak at all times except during the latter part of the night and early morning. This is attributed to the thick coating of the leaves on the pine preventing absorption of heat by the trunk, since the larch, which has similar wood, resembles the oak rather than the pine in the matter of temperature. The further conclusion is reached that the direct absorption of heat is the main cause of the high temperature of trees, and that it is largely dependent upon the character of the bark, smooth-barked trees being warmer as a rule than thick-barked ones.

The Longevity of Birds.—The swan is the longest-lived bird, and it is asserted that it has reached the age of three hundred years. Knauer, in his work entitled "Naturhistoriker," states that he has seen a falcon that was 162 years old. The following examples are cited as to the longevity of the eagle and vulture: A sea eagle captured in 1715, and already several years of age, died 104 years afterward, in 1819; a white-headed vulture, captured in 1706, died in 1826 in one of the aviaries of Schoenbrunn castle, near Vienna, where it had passed 118 years in captivity.

Parroquets and ravens reach an age of over one hundred years. The life of sea and marsh birds sometimes equals that of several human generations. Like many other birds, magpies live to be very old in a state of freedom, but do not reach over 20 or 25 years in captivity. The domestic cock lives from 15 to 20 years, and the pigeon about 10. The nightingale lives but 10 years in captivity, and the blackbird 15. Canary birds reach an age of from 12 to 15 years in the cage, but those flying at liberty in their native islands reach a much more advanced age.

Longevity of Elephants.—The journals of Ceylon have recently mentioned the death of an elephant that was well known on the island and had been seen by several generations of Englishmen. He was called Sello and had belonged to the last of the kings of Kandy. He was one of the hundred elephants that were taken by the English government in 1815, when the Kandyan dynasty was overthrown. At this epoch, the elephant was said to be fifteen years old. If this is correct, he died a natural death at the age of eighty-nine years.

Relation of Plants to Soil.—Mr. G. Ville, in a paper read before the Academy of Sciences, of Paris, shows that the composition of the soil influences plants in five principal characters, viz., the stature, the color, the amount of carotine and chlorophyl, and the quantity of vegetation. A table is given showing the difference in stature and color of plants of the common hemp according to the manure used, from which it is evident that this plant flourishes least in soil without manure, next in manure without potash, and in manure without nitrogen. The absence of lime and phosphate in the manure in the case of hemp did not interfere so largely with the color and stature of the plants. It would appear, therefore, that rich manure is essential, at least, to the development of foliage.

Structure of Pulpy Fruits. — To the *Annals of Botany* Mr. J. B. Farmer contributes an article in which, after pointing out the very different sources of the pulp in different fruits, he gives detailed descriptions of its mode of formation in the elder, dulcamara, blackberry and ivy. The term berry is usually applied to fruits in which the pulp or succulent tissue is derived from the pericarp, but in *Daphne mezereon* it is formed not only from the pericarp, but from the outer integument of the seed also. In *Citrus* it is due to hairs which spring into the ovarian cavities and become distended with fluid. In *Vitis* and *Solanum Dulcamara* the pulp is formed partly from the placenta and partly from the pericarp. In the latter, after fertilization of the ovary, the cells of the placenta grow out between the seeds, so as to give them the appearance of being sunk in it, and this growth is continued until met by a similar growth from the pericarp, so that the cavity of the ovary is then filled up with pulpy tissue. The outermost layer of cells of the ovules also undergo a change, their inner and side walls becoming lignified and the outer wall becoming mucilaginous and forming part of the mucilage of the pulp, just as it does in linseed. The red color of dulcamara berries is due to the appearance of a large number of chromoplastids derived from the chlorophyl granules. At the same time that this formation takes place, the starch in the fruit becomes changed to sugar.

Perfume of the Rose.—In an elaborate article on this subject in the *Bulletin* of the French Botanical Society M. R. Blondel states that the odor of the rose is chiefly developed in the group *Centifoliæ*, and especially in *R. centifolia*, Mill. The group *Caninæ* possess a similar perfume, which is, however, generally much more feeble. The hybrids produced by crossing tea roses (*R. fragrans*, Riv.) and Bengalese roses (*R. semperflorens*, Curt.) with *R. centifolia* give a great variety of odors; while the noisette roses (hybrids of *R. moschata* and *semperflorens*) are generally scentless. In the group *Banksiæ*, *R. Banksia alba* possesses a very pronounced odor of violets, while *R. Banksia lutea* has no marked perfume. The group *Cinnamomeæ*, with one or two exceptions, do not possess a strong odor, and the *Pimpinellifoliæ* are likewise nearly scentless. In the group *Villosæ* the flowers have but little perfume, but the leaves are glandular, and in *R. villosa*, L., emit a terebinthaceous odor. The section *Rubiginosæ* (sweet briers) are also remarkable only on account of the peculiar perfume emitted by the leaves of several species. In the petals of the fragrant species the essential oil resides in the cells of the upper and under epiderm; its presence may be easily detected by the use of osmic acid.

M. F. Crepin confirms the statement that the odor contained in the glands of the sweet brier, *R. rubiginosa*, L., and of the species nearly allied to it, is totally different from that of the other species of the genus.

The Adulteration of Confectionery.

To the Editor of the Scientific American:

In the editorial notes in your issue of January 18 you refer to the use of terra alba in confectionery, and state that the *Board of Trade Journal* of Portland, Me., is authority for the assertion that 6,000 tons of terra alba were recently imported through this port for use in confectionery. I have before me the letter of the editor of that publication in which he affirms that he had no authority for the statement, but that the article was clipped from some other publication and the credit left off in the make-up by mistake. I have been unable to trace the statement about the terra alba to any reliable source, or to find any truth in it.

The other statement in your note about the lozenge shipped to St. Louis over the South Shore Railroad emanated from the *National Druggist*, and I have before me the letter of the editor of that publication saying that the affair occurred five or six years ago, before the National Confectioners' Association was organized.

Believing the SCIENTIFIC AMERICAN to be a fair and honorable publication, that would not willingly do injury to an honorable calling, I write so that you may make such reparation as would be proper, to counteract the harm done by the publication in your widely circulated journal; for the circulation of such reports is an injury to the trade.

There is no terra alba used now by any reputable manufacturer of confectionery. The National Confectioners' Association "offers a reward of one hundred dollars for evidence that will enable it to convict any person of adulterating confectionery with poisonous or injurious substances, the association assuming the cost and responsibility of prosecuting the offender." The publisher of the *New York Confectioner* pledges himself to pay over an additional $100 to the person who furnishes him with the evidence that will enable the National Association to effect a conviction, and several large manufacturers each offer $100 upon the same terms as the *Confectioner*.

HARRY J. SHELLMAN,
Editor *New York Confectioner*.

New York, January 17, 1890.

[The above assurances that the adulteration of confectionery with terra alba has practically ceased are very gratifying, and we have much pleasure in placing them before our readers.—ED.]

Purgative Chocolate.

M. Giraud proposes a preparation made as follows:

Cacao (powdered and freed from oil)	50 grammes.
Sugar (powdered)	100 "
Castor oil	50 "
Vanilla (powdered)	q. s.

Make into tablets.

The oil should be incorporated with the cacao, and the sugar and vanilla added. The ingredients must be well worked up upon a heated slab, and allowed to cool in moulds.

RIO DE JANEIRO.

The recent overthrow of the monarchy in Brazil, and the establishment of a new republic under the name of the United States of Brazil, has called renewed attention to that wonderful country, which is larger in area than our own United States, and has an internal river navigation far exceeding that of any other state in the world.

Rio de Janeiro is the capital of Brazil. It is situated in latitude 22° 54' south and longitude 45° 36' west. It occupies the east side of a broad bay, which forms one of the most magnificent harbors in the world. The city was founded in 1556 by the Portuguese, at which time a large emigration took place. In 1808 King John VI. of Portugal fled from Lisbon on the approach of the French army under Napoleon I., and took refuge in Brazil. He proclaimed its independence and established a monarchy.

Rio de Janeiro consists of two cities, the old and the new. The latter has broad streets, the buildings well constructed and handsome. It is here one sees the Brazilian civilization and customs; here are the princely monuments, the commercial buildings, and, in a word, the social activity. Seen at a distance, Rio de Janeiro presents a panorama of grandeur and beauty. Above the anchorage is a castle, from which the signal flags float to announce the arrival and departure of vessels. Here are seen the lovely terraces of the public promenade, the Convent of San Bento, with its buildings and gardens, and numerous churches. The Botanical Garden at Rio de Janeiro is probably the finest in America. Here have been cultivated, from the earliest years of this century, the tea plant and other exotics from seeds brought from the Isle of France by the naturalist Lintz d'Abreu. Here is a celebrated collection of palms, arranged on each side of a long avenue. The trees are over 80 feet high, and form an immense array of columns with green capitals, presenting the appearance of an immense bower of a most surprising kind.

The spectacle seen on entering the Bay of Rio de Janeiro is grand and astonishing. The bay is surrounded by high mountains of granite. There are picturesque islands scattered about; various cities occupy the margins of the waters, between which and the capital boats are constantly plying. As the seat of a great empire, Rio de Janeiro has been the residence of the Tribunes of the nation, the General Assembly, the superior authorities, etc. It possesses an excellent university, military and civil academies, commercial institutions, charitable establishments, museums, libraries, a conservatory of music, arsenals, etc. According to the census of 1880 the population is 400,000. Our engraving is from *La Ilustracion Espanola*.

THE CITY AND HARBOR OF RIO DE JANEIRO, UNITED STATES OF BRAZIL.

Combined Toning and Fixing Bath.

The formula is as follows:

Dissolve in warm water	10 ounces
Acetate of soda	2 drachms.
Sulphocyanide of ammonium	2 "
Hyposulphite of soda	20 "

And when quite cold add to the above five grains of chloride of gold previously dissolved in about one drachm of distilled water.

The above bath has given me such satisfaction that for some time now I have used no other, except for purposes of experiment.—*Photo. Review.*

Type Setting by Machinery.

The substitution of mechanism for hand labor in the setting of types, although long delayed, may be now considered as realized, and the day cannot be far distant when the type-setting machine will be the principal reliance in all properly organized printing establishments. In this city the New York *Tribune* is almost wholly set up by the type machine. In Hartford, Conn., another form of machine, which proves very valuable and effective, has for some time been at work, and is thus described in the Hartford *Post:*

The *Post* is besieged with inquiries from all parts of the country concerning the practical working of the wonderful Thorne type-setting machines, which are known to have been in operation in setting the type for this paper for nearly three years, and for the last year or more have been thus employed to the exclusion of all hand composition for reading matter. The *Post* has four of these perfected machines in its composing room, though rarely more than three are in use, as a single machine will "set" from one to two columns per hour easily. The *Post* has given the Thorne the severest possible tests, at times under the most unfavorable conditions, with a view to discovering all imperfections or weaknesses and all causes of complaint which would be likely to develop under its practical use in newspaper and book offices or wherever types are set for printing. The result is all that could be wished, and the *Post* is prepared to indorse the machine fully and heartily as being a perfect substitute for hand labor and a wonderful economizer of time and money in the composing room.

It may be of interest to readers of the *Post*, as it certainly will be to contemporary publishers, to read a brief and not too technical description of the workings of the type-setting machines, as used in the daily production of this paper. The machines are started at 7:30 o'clock every morning, a small electric motor furnishing the slight power needed. Each machine has a keyboard, similar to that of an ordinary typewriter, and at each keyboard sits a young lady operator. Before her is spread the copy which she is to put in type, and her nimble fingers pass with such rapidity over the keys that she is able to set as much type on the machine in a given time as three or four compositors would in the same time set by hand. Her "case" is always full, for the machine automatically keeps itself constantly supplied with type, and thus no time is lost in "distributing." Should it be necessary to change copy at any moment, or any number of times, it can be done in an instant; and the interruption of rushing in an item at the last moment, when a machine happens to be otherwise employed, causes not the slightest inconvenience or delay. With ordinary care few or no errors are made. The machine itself cannot make a mistake, and all errors that occur are the result of insufficient attention or undue haste on the part of the person operating it. Every letter is deftly directed to its proper position by the ingenious little "packer," with as much delicacy and positiveness as if it possessed intelligence, and with such apparent daintiness of touch as to render injury to the types almost beyond possibility.

The machine is simple in its design and construction. Its parts are all easily accessible, and it runs hour after hour without giving its attendants any trouble beyond supplying it with copy and taking away the galley after galley of perfectly set type which it produces during the eight working hours of every day.

As before stated, the Thorne machine is giving perfect satisfaction here. It has proved itself equal to all the emergencies of a daily newspaper, and has come to occupy a place in the regard if not the affections of everybody connected with the *Post* which could not be filled in any other way. It has come to stay, first because it gives better service than handwork has ever given; second, because it does its work with three or four times the rapidity of the ordinary compositor; and third, because it saves a very large per cent of the cost under the old method. This is a great deal to say of any machine; but the pay roll of the composing room will substantiate the statement, and figures in such cases do not prevaricate.

A great many persons have, first and last, within the past year, visited the *Post* mechanical departments for the purpose of observing the operation of type setting by machinery. These include a number of prominent editors, publishers, and practical representatives of the principal printing industries of the country, some of whom have subsequently adopted the Thorne machine for immediate use in their own establishments.

The young ladies who preside at the *Post* machines are not easily annoyed by visitors, who are always welcome. The era of type-setting machines is upon us, as the keenest critics now generally admit. Employing printers recognize the significance of the fact in the steadily increasing number of orders for the Thorne machine which are now on that company's books; while far-sighted compositors are getting hold of and learning the keyboard, in anticipation of a demand for printer operators, who are sure to be preferred to fresh hands when the stampede of publishers to the machine begins in earnest.

Petroleum in Netherlands-India.

The *Deli Courant* states that search for petroleum along the banks of the Lepan River, in Langkat, has resulted in the discovery of large deposits of that oil. Raw petroleum oozes out of the ground at many places, where the natives have consequently dug pits. The output from most of the latter has never been considerable, and shows fluctuation. At Telaga Tunggal, where the boring reached a depth of about 350 feet, more important results have been arrived at. Appearances indicate that the main reservoir has been tapped there. The oil met with in the other pits and deposits proved to have found its way above ground from that storing place. The oil tested yields 35 per cent of lamp oil of good quality. It does not contain harmful ingredients, and offers advantages as a lubricator. The exact depth of the other deposits remains to be determined before an estimate of working expenses can be accurately made.

A Newfoundland Dog Gives a Fire Alarm.

A big Newfoundland dog recently saved six lives in Allegheny City. About one o'clock in the morning the dog awoke his master, Mr. F. D. King, by loud barking. Repeated efforts to quiet the brute failed, and looking out of the window, King discovered that the Boyle building was in flames. He called assistance and succeeded in rescuing from the burning building the members of three families.

MR. LORILLARD'S STEEL LAUNCH.

Mr. Pierre Lorillard has been in the habit, during the past few years, of cruising about the coast of Georgia and Florida with a party of friends on his large steam yacht the "Reva." He usually leaves New York as soon as the severe winter weather sets in and visits such resorts on the coast as the Jekyl Island Club, St. Augustine, Fernandina, etc. The luxury in which he lives is well known, and last winter his friends were interested in learning that he was not content with the ordinary comforts to be had upon a perfectly appointed yacht, but that he took with him a floating stable. This consisted of a sort of scow, especially built for the purpose, and fitted up with stalls and a carriage room, so that in case he or his friends wished to stop at any point and have a few days shooting, they could be quite independent of the inhabitants, and could well have all the luxuries of civilization on a deserted island. Many of the rivers, bays, and inlets of the Florida coast, however, are shallow, or have very high bars, and it was found that a good deal of good country was lost to the sportsmen, owing to the fact that they could not conveniently reach the field desired, and to that end Mr. Lorillard has had built the steel launch illustrated in the accompanying cut. Possessing considerable speed, and with light draught, she adds greatly to the service of the "Reva," and makes it possible to visit parts of the country that have hitherto been inaccessible. Her cabin is light, airy, and commodious, and she is adapted to make extensive trips up the beautiful rivers of Florida in perfect comfort.

This boat was constructed at the Jonson Iron Works, of New York. She is 65 feet long, 10 feet wide, and 6 feet depth.

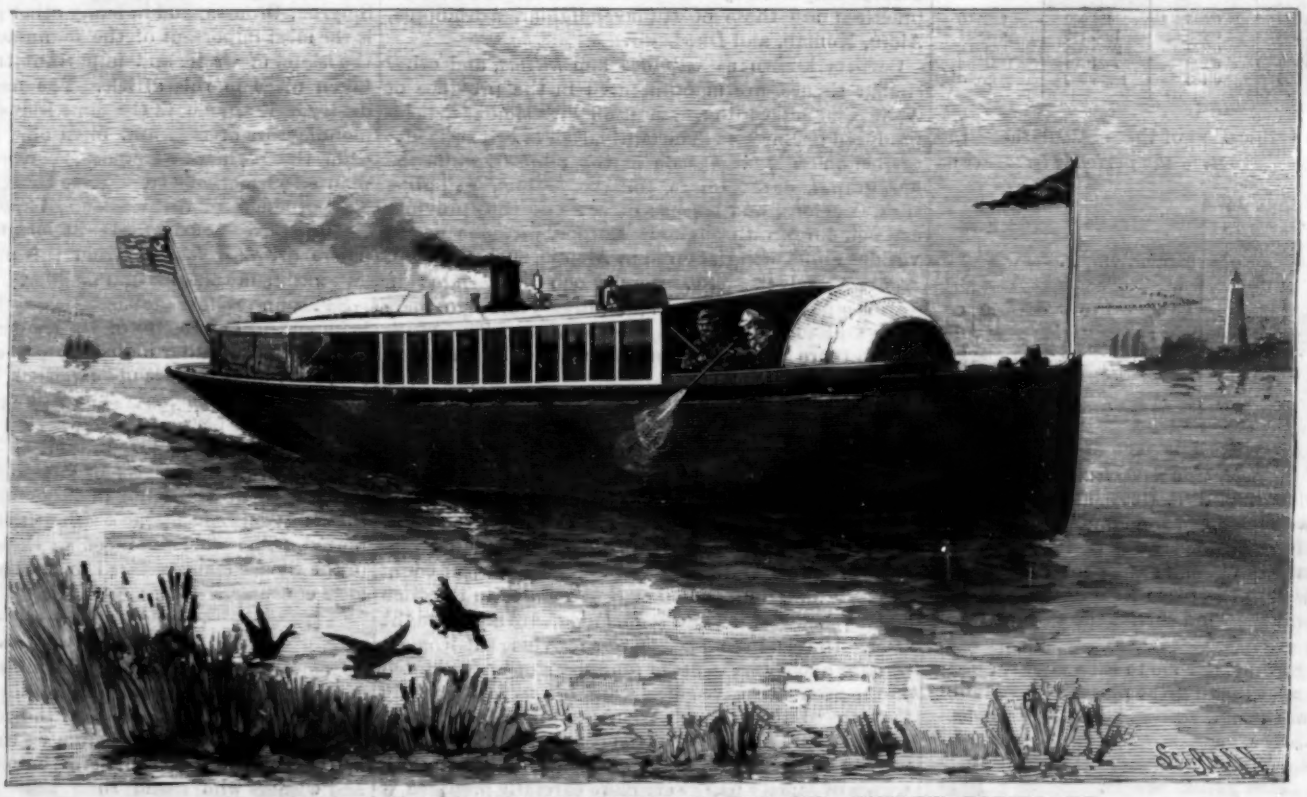
TRIPLE EXPANSION ENGINE FOR STEEL LAUNCH "LILLIAN."

She is built of 5-32 inch steel plates on her sides, and for bottom and shear strakes, 9-32 inch plates. For frames 1½ inch angle irons ¼ inch thick are used. Soft steel ¼ inch rivets driven cold are used to join the plates. Canvas is introduced in the seams, all of which are left uncalked. Her model is somewhat peculiar, the bilges being carried below the line of the keel, so that if she grounds she will rest horizontal as regards her cross section. She is driven by a screw 31 inches in diameter and 48 inches thick. The engine, which we illustrate separately, is built by the firm of Riley & Cowley, of Brooklyn, N. Y. It is an engine characterized by simplicity of construction and accessibility of parts, and from these features may be considered as peculiarly adapted to service of this nature. As the cut shows, the slides and moving parts are readily accessible from the starboard side. It is a triple expansion engine, with 4 inch, 6½ inch, and 10 inch cylinders and 8 inch stroke. There are three cranks set at an angle of 120° with each other. The high pressure and intermediate cylinders have piston valves, the low pressure cylinder has slide valves. The high pressure cylinder is forward. There are no links, and there are but three eccentrics for the three cylinders. These three eccentrics are close together on the rear end of the shaft; one operates the low pressure valve directly, the motion from the other two eccentrics is carried by through rock shafts to their respective cylinders. These three eccentrics work from a sleeve that is free to rotate upon the shaft. In the sleeve a spiral groove is cut, and in the shaft a straight keyway.

It is evident that a pin engaging both of these slots, on being moved in one or the other direction along the line of the shaft, would rotate the sleeve carrying the three eccentrics. Such a pin is provided, attached to a second short sleeve that slides freely outside of the other one. It is moved back and forth by rack and pinion movement, so as to turn the eccentrics one way or the other, reversing the engine whenever desired without the use of the complication involved in ordinary link motion. The estimated horse power is placed at 75, giving 450 revolutions with a steam pressure of 260 pounds to the square inch. There are independent air, circulating, and feed pumps. The surface condenser contains 120 square feet of cooling surface. The fuel to be used at present is anthracite coal. The boiler is F. D. Althause's sectional steam generator. Ultimately it is proposed to burn kerosene oil.

The cabin, averaging 9 ft. wide by 18 ft. 4 in. long, occupies the front portion of the deck house. It is ceiled with Georgia pine. The windows and doors are of mahogany, the latter with glass panels. The boiler and engine room come next, occupying the rest of the house. There are two folding bunks here for the crew. Aft of the cabin, under the deck, a cooking stove and lockers are placed. The cabin is furnished with lounges, tables, etc., and hammocks may be adopted for sleeping in.

The wheel is forward, and the steersman communicates with the engineer by electric signals. Forward, a canvas hood is provided for shelter while steering. Under the forward deck are the water tanks, which have a capacity of 800 gallons.



STEEL LAUNCH "LILLIAN," CONSTRUCTED FOR MR. PIERRE LORILLARD.

An Inventor Recognized.

The complaint is frequently heard that great inventors rarely enjoy the fruits of their labor in the way of a pecuniary return commensurate to their services, the harvest being in a majority of cases gathered by some not over-conscientious capitalist, to whose bounty the struggling inventor has been indebted for the means of perfecting his invention or who takes advantage of his necessity in other ways.

It is refreshing to hear of a case where both fortune and business preferment have been the rewards bestowed upon the individual whose inventive genius enabled him to earn such favors.

The Philadelphia *Daily Record* reports an instance of this kind which is worthy of notice. Says our contemporary, referring to this fortunate inventor:

His name is Claus H. Van Hagen, and he has devised a machine to forge twist drill, for which the Chester Twist Drill and Tool Company has paid him $25,000 in cash and $65,000 in stock. In addition to this he has been appointed to the position of superintendent of the Chester works, for which he will receive a weekly salary of $50. He has all his life been a poor man, and during the thirteen years he has been at work on his invention he has gone into debt to the amount of $10,000 or more.

This should serve to encourage the army of inventors in our shops and mills throughout the country, and it doubtless will in a measure. While there may be plenty of "room at the top," still, many of our "mute, inglorious" geniuses at the bench and the lathe have often realized that the road which reaches to that desired eminence is a difficult one. Success in invention, as in every other path where the reward is worth possessing, comes only to the undaunted, and after persevering and, in many instances, tedious effort. Each recorded success should serve as a stimulus to the fainthearted, and the case above quoted contains every element which should make it an especially encouraging citation to the ambitious artisan.—*The American Artisan.*

Cooling of the Body by Spray.

Dr. S. Placzek, following up some laboratory experiments by Preyer and Flashaar, on the effect of spraying a considerable part of the body surface of animals with cold water, has applied the spray for the purpose of reducing febrile temperatures in human beings. In the case of a man suffering from phthisis, whose temperature was high, he found that by spraying about a pint of water at between 60° and 70° F. over his body the temperature fell to normal, and continued so for several hours. Again, a similar method was satisfactorily applied in the case of a girl with diphtheria. In the healthy human subject the spray lowered the temperature nearly 2°, and in animals which had been put into a condition of septic pyrexia by injections of bacteria the temperature was reduced to normal by the spray. By keeping healthy guinea pigs and rabbits some hours under spray and using from half a pint to a pint of water at the temperature of the room—44° to 62°—the temperature of the animals fell several degrees. —*Lancet.*

Correspondence.

To the Editor of the Scientific American:

In your issue of December 7 I notice that the Reading Railroad officials have decided to make use of the coal dust as fuel by pressing it into bricks, applying steam during the process. It may be of interest to the readers of the SCIENTIFIC AMERICAN to know that the Chinese have been utilizing the coal dust in that way for a long time, only with the difference that they made the dust into "balls." I have used these balls myself, and found them excellent, especially in grates. I believe balls to be superior to bricks, on account of the air space between the surfaces, which promote draught. I think the promoters of the company mentioned in your paper would gain by employing presses of such a shape as to produce balls instead of bricks, which could easily be done by an arrangement like a mould. V. G.

Vancouver, B. C.

To the Editor of the Scientific American:

I have here some curious numerical relations. Their discovery was incidental to another line of investigation, and the facility with which they do the work heretofore assigned to the higher mathematics must be of general interest.

The mean distances and relative velocities in orbit of all the planets are derived from their periodic times.

The units of planetary time and space in our Copernican system are one day and one million of English miles.

Let the rate of motion, or velocity in orbit, be *the inverse cube root of their days.* The ratio for earth $\left(\frac{1}{7{\cdot}15}\right)$ being one unity, all other planetary velocities will be multiplied by its reciprocal.

Then the mean distance of any planet is produced from *one-fourth of its periodic time multiplied by its relative velocity.*

The figures obtained by means of these simple formulæ will state the distance with all the exactness that we are able to record the time. The two terms necessary for Kepler's third law are here evolved from one, and the reason for that law becomes obvious in view of the new data. These facts seem to imply something more important than another solution to a puzzle of two centuries. C. B. MCMEEKIN.

Cincinnati, O.

	Periodic Time in Days.	Ratio of Velocity. (Inverse cube root of periodic time multiplied by 7·15.)	One-quarter of the Periodic Time.	Mean Distance. (The product of one-quarter the periodic time by the velocity in units of 1,000,000.)
Mercury	87·960	1·61	21·990	35·400
Venus	224·700	1·173	56·175	65·837
Earth	365·256	1·0	91·314	91·314
Mars	686·980	0·81	171·745	139·113
Asteroids	Average 1736·000	0·595	434·000	258·000
Jupiter	4332·580	0·438	1083·145	474·417
Saturn	10759·220	0·323	2689·805	868·808
Uranus	30686·820	0·238	7671·705	1752·216
Neptune	60190·000	0·182	15075·000	2743·650

To assist in the verification of these calculations, the respective *inverse cube roots of the periodic times* are as follows:

Mercury	$\frac{1}{4\cdot44}$	Jupiter	$\frac{1}{18\cdot55}$
Venus	$\frac{1}{6\cdot06}$	Saturn	$\frac{1}{27\cdot1}$
Earth	$\frac{1}{7\cdot15}$	Uranus	$\frac{1}{41\cdot3}$
Mars	$\frac{1}{5\cdot82}$	Neptune	$\frac{1}{59\cdot2}$
Asteroids	$\frac{1}{12}$		

How a Spider Stretches His Web across a Street.

To the Editor of the Scientific American:

Your correspondent, T. S. K. (1608), asks "How does a spider get his web stretched from one side of a street to the other?" He takes an elevated position, spins his web, collects it into an irregular mass for his air ship, now fastens his web to the place he is about to leave, weighs anchor, and the wind carries the workman to a new *terra firma.*

Before the days came for me to earn my own bread (while on the farm), I found great pleasure in watching the many little workmen. DR. J F. BUCK.

North Topeka, Kan.

Removing Warts.

To the Editor of the Scientific American:

In your issue of December 7, F. B. asks, in queries and answers, how to remove a wart from an eyelid without injury to the eye. I may tell how I did it successfully some years ago, viz., simply by taking a clear piece of thick clean blotting paper, making a hole in it just large enough to fit snugly around the wart, allowing the wart to pass through the hole of the blotter, then by using a small clean stick of wood about the size of a match and dipping it into a bottle of Squibb's No. 1 impure carbolic acid, not diluted, and touching the top of the wart with the stick, holding a very small drop or particle of the acid, the blotter absorbing the surplus acid and preventing injury to the eye or skin outside of the wart, then removing the blotter, the ac'd causing the wart to turn to a whitish hue and in a few days to disappear forever. One or two touches of the acid at the first application were sufficient for a small-size wart. I have removed other warts quite successfully by a similar process. E. T.

Summit, N. J.

[An operation of this delicacy ought only to be tried, however, by a physician or optical expert.—ED.]

A Suggestion—The Domestication of Seals for Profit.

To the Editor of the Scientific American:

Suppose you write up the idea of domesticating the seal. A good seal skin is, I suppose, worth more than a sheep would sell for, and the seal, if its habits were understood, could be raised more cheaply than the sheep, especially along the seashore, and perhaps on the shores of Salt Lake, and possibly around fresh water streams and lakes. If so, there is no end to the area adapted to raising them. If I am rightly informed, the seal can be very readily tamed; in fact, takes naturally to domestication and hangs around its owner like a dog. M. W. GUNN.

La Salle, Ill.

Agricultural and Industrial Products of Turkey.

The *Journal de la Chambre de Commerce de Constantinople* says that frequent inquiries have been addressed to it from abroad respecting the agricultural and industrial products of the Ottoman empire, and in reply a statement upon the subject has been prepared, of which the following is a *resume.* On all points of the *vilayet* of Hudavendighiar the cultivation of cereals is carried on on a large scale. Sericulture is also in a flourishing condition, and the silks produced in the district are largely exported. The rose trees of Kezanlik imported some few years ago have been a great success, and essence and rose water has been prepared of almost as good a quality as that produced in Kezanlik itself. The vine is found in many parts of the empire, and is cultivated very extensively at Mont Athos, the Dardanelles, Tenedos, Chio, and Smyrna.

The cultivation of opium is carried on in the greater part of the empire, and is particularly prosperous in the *sandjak* of Malatia. Dyeing materials, such as indigo, cochineal, etc., are found in the *vilayets* of Syria and Aidin, and it is desired to extend their cultivation in the interior of Anatolia. The provinces and *sandjaks* which, independently of cereals, produce cotton for local consumption as well as for export, are Smyrna, Magnesia, Adana, Aleppo, Demas, Nablour, Mossoul, and Bassorah. Cotton is also cultivated in the interior of Anatolia, and in the greater part of the *vilayet* of Maamurat-ul-Aziz. The rearing of bees and silkworms is carried on to a very large extent in Turkey. The principal *vilayets* in which these industries are practiced are those of Hudavendighiar, Adrianople, Aidin, Koniah, and Diarbekir.

Carpets known as *sedjades* and *kilims*, and other similar tissues, are manufactured in the province of Aidin, and enter into competition with similar articles produced in Europe. The cultivation of cereals is also carried on on a large scale in the *vilayets*, while the figs, grapes, dates, olives, tobacco, opium, gall-nuts, silks, woolens, and essence of roses of this province are well known throughout Europe. At one period various stuffs manufactured at Aleppo, such as *zerbaf*, *ergherie*, velvets, etc., were much appreciated in various parts of Europe, and thirty years ago there were still 40,000 looms in the province. The stuffs woven there had a high reputation, not only in Turkey, but throughout Europe.

At the present time there are only very few looms existing. At Diarbekir, stuffs for wearing apparel are produced which, known under the name of *petie*, comprise a species of fine cloth (*burumdjik machlak*), and another resembling satin. The fineness of these stuffs is much appreciated. The shawls and veils, known as *djar*, *tcharchef*, *zar*, and *rehide*, produced in the province are superior to similar products of other countries. Wines, liquors, and elixirs prepared in the same *vilayet*, such as *hara* and *rouhelhagat*, are much sought after. In certain villages of this province the women, who for a loom make use of four pieces of wood planted on the ground, weave carpets and *kilims* so admirably that they have been occasionally taken for Persian shawls. The silk and cotton tissues of Bagdad are worthy of attention. If the *machlaks* (a kind of cloth woven of camel's hair) were more carefully prepared, it is said they would find a ready sale in all parts of the world. At Saida silks and woolens are produced, and indigo is largely grown. In the *vilayet* of Tripoli (Asiatic Turkey) olives and tobacco are produced, and the sponge fishery is carried on to some extent. Manufactured articles are silk, soap, tissues, and girdles.

Oranges, lemons, and other fruits are also extensively grown, while a large export trade is carried on in wool. In Arabia, coffee, saffron, and vegetable ivory are found. The finest coffee is produced at Yemen. The exports from Tripoli (Barbary) comprise ivory, ostrich feathers, olive oil, wool, cereals, and cattle. All kinds of vegetables are grown there, and there is a species of madder, the color of which is a deep red. This color is used in dyeing, and considerable quantities of it are exported. There are various descriptions of dates grown, and from them is extracted a species of brandy called *boha*, which is exported in earthen jars known as *goul-goul.* In cutting the upper part of the date trees, a liquid exudes of a dark color and very sweet taste, which is called *leken*, and which makes an excellent beverage when fresh. In about six hours this liquid ferments and is transformed into a wine with an agreeable taste. Olives are one of the principal sources of the wealth of the country. There is one description of olive oil which is called *harati*, and this is considered superior to the best oil of Crete.

There are also found in great abundance fruits, such as apples, figs, grapes, mulberries, peaches, apricots, sweet oranges, and citrons. Melons are grown on a large scale, and those called *kalvaz* have an exquisite flavor. The principal description of sheep is the *karaman*, which breeds twice a year. Goats and camels are also found in great numbers. In Turkey the industries adapt themselves to the tastes and habits of the inhabitants, and, therefore, are not much appreciated abroad. To quote one example among many others, mention is made of the tissues known as *aladja* and *buluk*, and which are manufactured in the *sandjak* of Orfa. These are now woven exactly in the same way and on the same pattern as they were 500 years ago. There are two species of camel reared in Bagdad, and flocks of sheep are abundant in various districts of this province. The skins are used in the manufacture of boots (*babouches*) and sandals (*yemeni*). The horses reared in this *vilayet* have not their equal in any part of the world.

Attempts have been made from time to time to reproduce the race of Bagdad horses in France, England, and Russia, with the result only of improving the existing breeds in those countries. The soil there is exceedingly fertile, and the principal products are barley, wheat, rice, and dates. Independently of these products, cotton, sesamum, beans, peas, and lentils are largely grown, while every description of fruit abounds. These products are exported in large quantities to India and European countries. Opium is also largely cultivated. At Hele, part of the population is engaged in agricultural and part in industrial pursuits. The *kefle*, *tcharcheb*, *abani*, *machlak*, and other woolen and cotton stuffs are woven there. Weaving, wood carving, and shoe making are extensively engaged in, while these industries are also carried on in Bagdad. The industry which principally affords the means of livelihood to the Jewish inhabitants is the weaving of the *abani*. In localities such as Nedjif, Echref, and Echra, *machlaks* of good quality are manufactured.

Materials for scent making are found in abundance in the *vilayet* of Crete, and they are also found at Smyrna, Broussa, and in many other provinces. Soap is the most important of the manufactured articles of the island of Crete, and important transactions have taken place in this article. The most important industry of Rethymo, in the same island, consists in the manufacture of soap and olive oil. In the island of Chio the plain of Cambos is covered with gardens planted with orange trees, olive trees, and mastic trees. The products of the woolen, silk, and cotton manufacture have considerable importance at Beyrout. There are also exports from this province of olives, gall-nuts, silk cocoons, and madder.

Samsoun produces tobacco, while the port of Sinope is important on account of its timber. Harness making and several other industries exist at Erzeroum; the products, however, are not exported, but are required for local requirements. The principal source of the wealth of the peasant is the rearing of domestic animals, such as oxen, goats, and sheep. Near the Persian frontier, near the *vilayets* of Van and the *sandjak* of Hekiari, cattle are found in large numbers, and from these districts considerable quantities of skins are exported. The wool produced in these districts is used in the tissues manufactured to suit the requirements of local consumers.—*Jour. Soc. Arts.*

Developing Genius.

Genius unexerted is no more genius than a bushel of acorns is a forest of oaks. There may be epics in men's brains, just as there are oaks in acorns, but the tree and book must come out before we can measure them. We very naturally recall here that class of grumblers and wishers who spend their time in longing to be higher than they are, while they should be employed in advancing themselves. How many men would fain go to bed dunces and wake up Solomons! You reap what you have sown. Those who sow dunce seed, vice seed, laziness seed, usually get a crop. They that sow wind, reap a whirlwind. A man of mere "capacity undeveloped" is only an organized day dream, with a skin on it. A flint and a genius that will not strike fire are no better than wet junkwood.—*Ralph Waldo Emerson.*

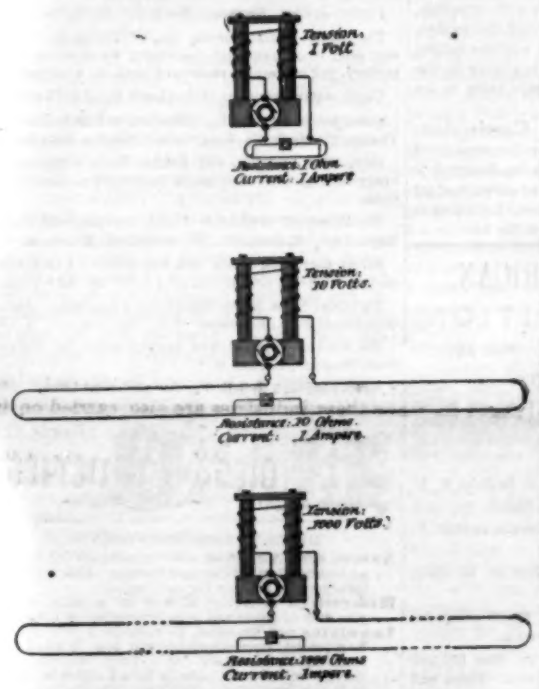
HIGH AND LOW TENSION ELECTRIC CIRCUITS.

T. O'CONOR SLOANE, PH.D.

An error in scientific nomenclature does not always imply ignorance. The chemist invariably calls carbonous oxide carbonic oxide, and calls the higher oxide of carbon either carbonic acid or carbonic acid gas. Several such inaccuracies have become so engrafted upon the science that they are accepted and used universally. Electricity has been defined as the science of measurements. It might with more propriety have been termed the science of nomenclature and definition. Any tendency to error in its terminology is to be avoided. Every day an inaccuracy is perpetrated by electricians as well as by the laity which should be stopped, especially as no end is served by its continuance. It is the use of the term high and low tension current or high and low potential current. Neither tension nor potential can be attributes of an electric current. The use of such an expression may conduce to convenience; but if for the word "current" either "system" or "circuit" be substituted, an improvement at least is effected. The worst of the matter is that this application of the term tension has given a false conception of the true nature of a current.

A current passing through a circuit is urged by electromotive force, or by a difference of potential, which, in a certain sense, forces the current through the wire. The term tension is correct if used to denote this difference of potential; but it no more expresses an attribute of the current than the elevation of Lake Glazier expresses an attribute of the flow of the Mississippi. It influences its flow, but is not a function of it.

The error is worse when a current of so many volts is spoken of. A current is rated by amperes, not by



HIGH AND LOW TENSION ELECTRIC CIRCUITS.

volts. A wire carries current at the rate of so many amperes, a current cannot be measured in or be designated by volts.

Some diagrams are given to show when a current is produced how a high and low potential difference may produce absolutely identical currents. For convenience simple numbers will be used throughout the description.

Three dynamos with their circuits are shown. The first dynamo is supposed to maintain a difference of potential of one volt at its terminals. The terminals are supposed to be connected with a wire ten feet long of one ohm resistance. A current of one ampere will pass through the wire.

The second dynamo is supposed to maintain a difference of potential of ten volts, and to have its terminals connected by one hundred feet of the same wire. This will give a current of one ampere, just as before. Finally the third dynamo is supposed to give a difference of potential of one thousand volts, its current passing through ten thousand feet of the same wire. As before, the current will be of one ampere intensity. Under the popular terminology, the first two cases would be called low tension currents and the last a high tension current. Yet the currents in the three cases are absolutely identical.

To illustrate this still further, equal lengths of the different circuits can be compared. Suppose a section of five feet is taken and its electrical data determined. It will in all three cases be found to be passing a current of one ampere intensity. The difference of potential from end to end of the section will in all three cases be one-half a volt. Thus, if equal portions are compared, the three currents, high and low tension "currents" socalled, are found to be identical. In like manner if ten foot sections of the different wires be compared, the same current of one ampere, with a difference of potential of one volt, will be found in all three. The popular term indicates the original difference of potential, but is very incorrectly used. It would be far better to consider the whole circuit with its generator and apply the adjective to it—speaking of a high or low tension circuit or of a 1,000 volt circuit, alluding in all cases to the maximum difference of potential that is maintained in the circuit when in operation.

Copper Guns.

It is matter of very recent history that the alloy of copper, zinc, and tin, known as gun metal, was employed in the construction of guns with great success. There are still in existence scores of so-called "brass" field pieces, and very powerful and excellent weapons they were. They have long since been superseded by guns of longer range and greater accuracy. It is noteworthy, however, that brass guns seldom burst. Their great defect was a tendency to droop at the muzzle when fired rapidly. The enormous steel guns of H. M. S. Victoria have developed a similar defect, and are being returned to Elswick to be straightened and stiffened by carrying a breech hoop further forward. We have spoken of brass guns to show that there is nothing new in the idea of employing copper to some extent in the manufacture of guns, but the purpose we have in view at present is to suggest its use in a way which we believe to be novel. It is generally known that modern guns, both heavy and light, are rapidly destroyed, as far as the chase is concerned, by what is technically known as "scoring." The projectile does not fit the bore dead tight. The powder gases—charged, no doubt, with unburned powder in the condition of sharp dust, and intensely heated—rush through the insignificant crannies between the shot and bore, and cut channels in the latter. The mischief, once begun, goes on rapidly, and in a very short space of time the whole inner surface of the gun is plowed up and roughened and furrowed to a disastrous extent. Nothing remains but to cut the steel lining tube out, and replace it with a new one.

We suggest, as a subject for a not very costly experiment, the substitution for steel of some copper alloy wherewith to line our guns. In the smaller natures, the present lining tube is a plain steel barrel a couple of inches thick, over which are shrunk hoops or rings of steel. The innermost tube is not supposed to impart any strength. It is intended to receive the rifle grooves, and endure wear and tear. In the larger natures of guns, the inner tube plays a far more important part. It is an extremely costly article, bored out of a solid forging. To the difficulties met with in making these tubes may be attributed most of the delay experienced in obtaining heavy guns for our ships.

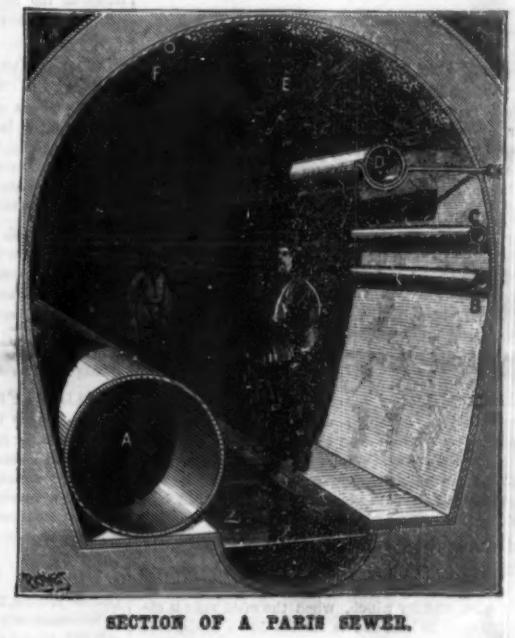
It may be urged that to adopt a comparatively soft material in lieu of tempered steel as a lining for guns would be a mistake, but we think not. It is well known that it is next to impossible to score copper with powder gases. Touch holes, for example, are bushed with copper. Vents made directly in the iron or steel are scored up a great size by comparatively few discharges. Soft tough metals resist abrasion exceedingly well. Thus, for instance, it is very difficult to cut copper on a fine emery wheel. Lead cannot be so cut at all. The end of a copper bolt may be held for an hour against an emery wheel almost without effect, but the same wheel will cut up a file at the rate of two inches a minute. All experience goes to show, then, that it would be quite possible to use a gun with a copper-lined bore, which would be practically exempt from scoring. But such a gun could not be rifled, at least we fail to see how sufficient stubbornness could be imparted to the grooves. But although copper would itself be too soft, it does not follow that its alloys would be, and our proposal is simply that a steel gun should be made and fitted with a liner of phosphor bronze, manganese bronze, or Delta metal, and the results ascertained. The cost of the experiment would be very small. It would only be necessary to take some gun which needed retubing, and, instead of lining it with steel, line it, as we have suggested, with a copper alloy, and then go on firing it to destruction.

If we can substitute copper alloy for steel as a liner, the construction of big guns would be enormously facilitated. The tubes could be cast and bored out. They could be rolled to toughen and consolidate them. As the metals we have named have enormous ductility, they could be put into a gun comparatively loose, and expanded to fit the bore by a couple of rounds, as proposed years ago, and carried into effect by the late Major Palliser, when he converted cast iron smoothbores into rifled guns, by fitting them each with a steel lining tube. There need be no apprehension that the gun would be weakened, for any of the alloys we have named could be made to bear as much as forty tons on the square inch, while remaining exceedingly tough, whereas a steel of the same strength would be extremely brittle. It is not easy to see what the objections are to the system of construction which we suggest, and a steel gun with a manganese bronze liner may yet prove to be the gun of the future. Be this as it may, it seems that the experiment would be worth carrying out, but care should be taken not to spoil the experiment by using a badly selected alloy or an unsuitable system of rifling.—*The Engineer.*

PARIS SEWER, ELECTRIC WIRES, AND PNEUMATIC TUBES.

In Paris the city station Bergere has aerial cables, and these are used by the Faubourg St. Martin station. But the new companies that have just received grants will be able to establish subways only. The sewers have been reserved for the cables of the municipal service. If we consider that the cables, although protected by mouldings or otherwise, are at the mercy of the force of workmen who traverse the sewer, and are exposed to humidity and several other causes of damage, this is perhaps not an advantage. It must, moreover, be remarked that the sewers are greatly encumbered by telephone and telegraph cables, and by pipes for distributing compressed air.

In the illustration we show a section of a sewer in Opera Avenue. At A there is a water main, 3½ feet in diameter; at B and C, two 4 inch water pipes; at D, an 8 inch pipe for the distribution of compressed air; at E, several large bundles of telegraph and telephone wires; and at F, a pipe for the passage of compressed air for setting pneumatic clocks. To these still should be added the pipes that serve for the pneumatic post of Paris. The large number of conductors already established will be especially remarked. Under such conditions for the placing of wires, especially for alternating currents, it is indispensable to take precautions against the phenomena of induction. It might seem as if the most advantageous means for this purpose would consist in the adoption of concentric cables.



SECTION OF A PARIS SEWER.

Now, such cables, which are already employed in several distributions, present great inconveniences, both as regards making connections and the security of the service, and, despite experiments, the use of them has not as yet entered thoroughly into practice. It is probable that the sewers will not be used for this purpose. The various electric lighting companies are taxing their wits to find models of subways for the laying of their cables as advantageously as possible.

We shall not fail, when the occasion occurs, to describe the principal methods employed, and which will finally settle us as to the practical establishment of subways—a question which is certainly the most important one in distributions.—*La Nature.*

A Novel Project.

When it was stated some weeks since in the newspapers that the building of a milk pipe line from a point in New York State to New York City was projected there was a rather general smile, and the matter was treated as a joke. The projectors were, however, it seems, in sober earnest. A company with a capital of $500,000 has, it is announced, been formed at Middletown, N. Y., for the purpose of constructing such a line. The proposed method of forwarding the milk is in cylindrical tin cans surrounded and propelled by water, and the promoters of the scheme assert that the time of transportation for a distance of 100 miles will not exceed an hour, while the profit will be about one cent a gallon. *Fire and Water* thinks if this sort of thing goes on, we need not be surprised ere long to find New York the converging point not only of oil, natural gas, and milk pipe lines, but of whisky ducts from the blue grass regions, and beer ducts from Cincinnati, St. Louis, and Milwaukee. The pipe manufacturers may well feel cheerful at the prospect before them.

RECENTLY PATENTED INVENTIONS.

Railway Appliances.

CAR COUPLING.—James M. Cosby, Elberton, Ga. The drawhead of this coupler has an abutment portion, projecting over which is a vertically swinging coupling hook with depending beak, while a fixed hook portion with upwardly extending beak projects beyond the abutment at one side of the beak of the coupling hook, in connection with a pivoted coupling pin and lever.

SINGLE RAIL ELEVATED RAILWAY.—John N. Valley, Jersey City, N. J. Combined with a series of independent hangers, each having a flat horizontal arm, are independently supported rails connecting the hangers, with lateral lugs that rest flat on the arms, forming a construction costing but little, and with a minimum number of parts.

Mechanical.

SOLDERING APPARATUS.—John H. Michaelson, Jr., Philadelphia, Pa. This apparatus is constructed with work-supporting disks and heating burners therefor, with vertically movable soldering irons, in combination with a treadle mechanism for raising and lowering the soldering irons above the disks, it being designed that one person with the apparatus will solder many more cans than has been heretofore possible.

TILE MACHINES.—Aaron Mark, Ivesdale, Ill. This invention relates to cut-off tables for tile-making machines, providing for the support of the newly moulded tile strips, whereby their form will be maintained, and consisting of an endless carrier belt with brackets and supporting blocks, the blocks being adjustable to fit closely against the peripheral face of the tile.

MITER BOX.—Edwin G. Herbert and Francis L. York, Ann Arbor, Mich. This is a miter box adapted for use with the ordinary hand saw, whether long or short, thick or thin, wide or narrow, setting itself automatically at the more commonly used angles, and which may be set at any angle from ninety degrees to about ten degrees in either directio

Agricultural.

CORN PLANTER.—Adam Wenzel, Dakota City, Neb. Combined with the body frame is a forward frame having feed boxes and chutes, with other novel features, the corn being automatically dropped twice for each revolution of the main wheels, while the furrow is closed by metal wings or shields, and the earth pressed over the furrow.

HARROW AND CULTIVATOR.—Asa C. Brown, Eugene City, Oregon. This is a combination implement, the main frame of which has handles and a draught bail, a shovel-carrying auxiliary frame being adjustably connected to the main frame, while cutters or guiding rods extend downward and to the rear from the rear end of the frame, and a rotary harrow is arranged for connection with the central portion of the frame.

MILK CAN.—William C. Thornton, Jefferson City, Mo. This is a receptacle for new milk, adapted to seal the contents and permit the submerging of a sealed can in a cistern or spring of water, and which may be used to separate the cooled milk from the cream, and indicate when the separation has been completed.

HORSE HAY RAKE.—Willard Clemens, Le Roy, N. Y. This invention provides means whereby the auxiliary rake may be dropped independent of the main rake, and by which, when the main rake is elevated to drop its load and is carried down again to its normal position, the auxiliary rake, if lowered, will be simultaneously elevated with the lowering of the main rake.

BEEHIVE.—Jackson B. Wilcox, Manistee, Mich. This invention provides means whereby a hive carrying movable comb frames and having a removable bottom may be converted into an invertible hive in a simple and expeditious manner.

Miscellaneous.

SADDLE.—William R. Thompson, New Castle, Col. This is an improvement in the class of saddles generally used by stockmen on the plains, in which two girths are employed and straps are used in connecting the girths with the saddle, the invention covering novel constructions and combinations of parts.

PURIFYING PETROLEUM.—Robert M. Perrine, Cleveland, Ohio. This is a process for deodorizing and purifying crude oils, consisting in agitating them with chloride of lime, then adding sulphuric acid to eliminate the chlorine gas and neutralize and precipitate the alkaline matters, according to a method described, and finally drawing off the purified oil.

MOP AND WRINGER.—Carington L. Westbrook, Reynolds, Ind. Cloth-covered rollers, from which project feed teeth in longitudinal rows, are journaled in a suitable frame, there being upper and lower bars adapted to be raised and lowered, with other novel features, whereby it will not be necessary to wet or soil the hands in wringing the cloth and adjusting the machine.

SHUTTER WORKER.—James K. McGukin, Newark, N. J. This invention provides means whereby the window shutter may be opened or closed from the inside of a room without raising the sash, and locked in any desired position, the invention being an improvement on a former patented invention of the same inventor.

TRUNK.—William W. Brinkerhoff, Albany, N. Y. This is a trunk having fixed fastenings designed to be effective and durable in strengthening and holding the trunk together, dispensing with trunk straps, and relieving the strain on the lock and hinges arising from rough usage.

WAGON BODY.—Thomas Tyson, Mound City, Mo. This is an improvement in wagon bodies especially adapted for farm use, and is designed to simplify the construction of a wagon body heretofore patented by the same inventor, whereby the side boards may be more conveniently manipulated and the rear end of the wagon body less obstructed when the end gate is thrown down to remove the load.

FOLDING LADDER.—Pierre F. M. Burrows, Auckland, New Zealand. This is a ladder adapted to be readily adjusted to the inequalities of the ground or other support, and which can be quickly and compactly folded when not in use, the construction being strong and simple, and designed to be entirely safe under all circumstances.

PREPARING LUMBER.—Thomas H. Sampson, New Orleans, La. This invention covers an apparatus for treating lumber to prevent its warping and twisting, and consists of a long iron shell or cylinder that can be made air tight, in the bottom of which is a cast iron manifold box with compartments for live and exhaust steam, with other novel features.

ORE WASHER.—Samuel C. McLanahan and William P. Kirk, Hollidaysburg, Pa. This invention relates to ore washers in which a revolving shaft or cylinder is provided with detachable radial blades for agitating and washing the ore, the invention relating more particularly to the blades and their means of connection to the shaft or cylinder.

GELATINE MOULDS.—Gustav Koller, Vienna, Austria. This invention provides a process for treating glue and gelatine moulds for casting works of art, the moulds being adapted for making serviceable plaster and wax casts and permitting of pouring alloys of a low melting point directly into them, and the invention consisting of treating the surface of the mould with strong oxidizers and afterward exposing it to the action of the light.

ALARM LOCK.—Eleazer Harmon, Baltimore, Md. This lock is so made and its parts so connected that when the key is properly turned and removed from the bolt casing an alarm will be sounded, if the bolt should be thrown back to even a partially unlocked position by persons either on the outside or inside of the room, the invention being an improvement on a former patented invention of the same inventor.

WELL BORING APPARATUS.—Lawrence V. Elder, New Orleans, La. This apparatus is to sink wells by means of a stream of water injected into the well shaft or boring under pressure, the invention covering special means for establishing temporary communication between the well pipe or tubing and the pumps to maintain a constant flow while adding a new section to the tubing.

FURNACE DOOR OPENER.—Andrew H. Ballagh, Macon City, Mo. This is an attachment for opening the door by means of a treadle, leaving the hands of the operator free to throw on coal or rake the fire, a spring being arranged to close the door when the pressure on the treadle is removed, with other means for holding the door open against the tension of the spring when so desired.

BALING PRESSES.—Alvin Allen, Girard, Kansas. This invention covers a follower operating mechanism for presses employed in baling cotton, hay, etc., and provides for two forward movements of the follower for every revolution of the sweep or lever, and for a rapid movement of the follower during the preliminary compression of each batch of material, with an effective application of the power during the final compression.

PICKING FUR SKINS.—William A. Connolly, New York City. This is a machine designed to automatically feed the skin to place, blowing the soft hair to one side, and exposing the coarse objectionable hair, retaining the skin in position for clipping such coarse hair, and feeding forward knives to act thereon.

MAKING CLAY CONDUITS.—James J. Powers and Robert Van Buren, Brooklyn, N. Y. This invention covers a machine for making clay conduits for electric wires, etc., hydraulic or fluid pressure being employed for compressing the clay into form and for forming apertures in the section, two pistons and two cylinders being used, one shaped in part to form the mould.

VENTILATING CONDUITS.—John H. Hilliker, New York City. This invention provides for establishing communication between the conduit, the sewer, and the culvert and manholes of the sewer, whereby escaping gases may find speedy and convenient exit to the open air, obviating danger from explosions and upheavals of the road bed or pavement.

CAN TOP.—George J. Record, Conneaut, Ohio. Combined with a can cap having an apertured dome is a spout-carrying cap fitted to turn on the dome of the can cap, an apertured packing between the caps, a bolt projecting through the packing and spout cap, and a thumb nut on the bolt, whereby any wear may be taken up caused by the turning of the spout-carrying cap.

MEASURING FAUCET.—John A. Kendall, Maysville, Mo. This invention covers a novel construction and arrangement of parts in a faucet designed to accurately measure the quantity of liquid withdrawn from a cask or receptacle, and furnish a record thereof.

DENTAL APPARATUS.—Samuel A. Milton, Clinton, Mo. This is an apparatus for use in the introduction of medicated heated air or nitrous oxide gas to the tooth under treatment, provision being made for the charging of the conveying medium with the vapors of such volatile oils as it may be desired to employ.

ROLL PAPER HOLDER.—John Zerr, Quincy, Ill. This is a holder and cutter, the invention relating to the means for supporting the roller and causing the necessary tension upon the roll of paper to prevent it from being too freely unwound or running off more than is required when pulling on the free end of the paper.

RE-ENFORCED RATTAN ARTICLES.—Elias Depersenaire, New York City. This invention provides a method of making articles, particularly carriage bodies, which, while having the appearance of being made wholly of rattan, are built up with an interior re-enforcing frame, concealed by an exterior reed wrapping or covering, to be very substantial and ornamental.

SHOE SCRAPER.—Cornelius A. Sparrow, Mechanicsburg, Ill. This is a device formed with a standard adapted to be secured in any desired position, and designed to facilitate the cleaning of the sides and edges and bottoms of boots and shoes, while on the feet of the wearer.

MANGLE.—Robert N. Reid, Orange, N. J. This is an adjustable and self-adjusting machine, designed to work easily, smoothly, and almost noiselessly, and adapted more especially for household or family use, for mangling a large variety of fabrics, such as table and bed linen and clothing.

PENCIL SHARPENER.—John Bigham, Ripon, Wis. This device has a pencil-receiving shaft and means for revolving it, means for holding the pencil therein, and a grinder arranged to be brought to bear upon the pencil, making a cheap and effective device for sharpening lead or slate pencils.

SEPARATING SOLDER FROM TINNED IRON.—William E. Harris, New York City. This invention covers a method which consists in coating the article with a substance which will prevent molten solder from adhering to it, and then melting the solder from the article, which may be effected by first smelting the article by burning petroleum on it.

ARMOR FOR SHIPS.—Isaac B. Abraham, San Francisco, Cal. This invention consists in combining with a vessel a gunwale formed of a series of sections, hinged at their lower ends to the deck of the vessel, and adapted to be elevated to form an armor against attack, and also form a protection against waves during storms.

COMBINED CAP PILLOW, ETC.—François Frank, Grass Valley, Cal. This is essentially an air-tight bag, adapted also for use as a life preserver, and consists of an upper and lower cylindrical section, one adapted to fold in the other, gore sections uniting the cylindrical sections, while there is a valve in the upper section to admit air, and an escape valve in the lower section.

GAS STOVE.—James H. Carrington, New York City. The body of this stove is composed of perforated metal, with closed top, it being designed to obviate all centralization of draughts or currents of air or heat, and give free outward radiation of the heat at all points, the burner being mounted on the base.

SCIENTIFIC AMERICAN BUILDING EDITION.

FEBRUARY NUMBER.—(No. 52.)

TABLE OF CONTENTS.

The Scientific American Architects and Builders Edition is issued monthly. $2.50 a year. Single copies, 25 cents. Forty large quarto pages, equal to about two hundred ordinary book pages; forming, practically, a large and splendid MAGAZINE OF ARCHITECTURE, richly adorned with elegant plates in colors and with fine engravings, illustrating the most interesting examples of Modern Architectural Construction and allied subjects.

The Fullness, Richness, Cheapness, and Convenience of this work have won for it the LARGEST CIRCULATION of any Architectural publication in the world. Sold by all newsdealers.

MUNN & CO., PUBLISHERS,
361 Broadway, New York.

Business and Personal.

The charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

All books, app., etc., cheap. School of Electricity, N.Y.

Wanted—Competent man to take charge of a machine shop building special, heavy machinery. Give age, experience, references, wages. Address T. R. H., box 66, Chicago, Ill.

The undersigned, experienced inventor, will develop inventions, perfect mechanisms, or invent them for inventors who cannot complete their work. Strict confidence and satisfactory results guaranteed. Charges or conditions, according to labor involved. Address "Experience," care of Scientific American, New York City.

Money, Time, and Life Saved.—Draught gear for vehicles, patent No. 418,628, December 31, 1889. Prevents damage to horse, vehicle, and occupant. Inexpensive, durable, simple, easily operated. Thoroughly tested. United States, Canada, and Brazil for sale by inventor, P. H. Thompson, Bluffton, Ga.

Salesmen can add to their incomes by selling our goods on commission. Commissions to one salesman, who devoted only one hour daily to our goods, averaged twenty-five dollars per month for past three months. Our goods have been on the market for twenty-one years, are well known, and are first class in every respect. Address "Commission," care Scientific American, New York.

Machine tools, catalogue No. 47-B; wood-working machinery, catalogue No. 53-A; steam power, catalogue No. 48. Largest lines offered by any firm in this country. Send for bed-rock prices, stating exactly what you want. S. C. Forsaith Mach. Co., Manchester, N. H.

Best Ice and Refrigerating Machines made by David Boyle, Chicago, Ill. 140 machines in satisfactory use.

Guild & Garrison, Brooklyn, N. Y., manufacture steam pumps, vacuum pumps, vacuum apparatus, air pumps, acid blowers, filter press pumps, etc.

For the latest improved diamond prospecting drills, address the M. C. Bullock Mfg. Co., Chicago, Ill.

Presses & Dies. Perracute Mach. Co., Bridgeton, N. J

The Holly Manufacturing Co., of Lockport, N. Y., will send their pamphlet, describing water works machinery, and containing reports of tests, on application.

Tuerk water motors at 12 Cortlandt St., New York.

Screw machines, milling machines, and drill presses. The Garvin Mach. Co., Laight and Canal Sts., New York.

Iron, Steel, Copper, and Bronze Drop Forgings of every description. Billings & Spencer Co., Hartford, Conn.

The Improved Hydraulic Jacks, Punches, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

Safety Elevators, steam and belt power; quick and smooth. The D. Frisbie Co., 112 Liberty St., New York.

Tight and Slack Barrel Machinery a specialty. John Greenwood & Co., Rochester, N.Y. See illus. adv., p. 175.

For steel castings of best quality, write the Buffalo Steel Foundry, Buffalo, N. Y.

Acme engine, 1 to 5 H. P. See adv. next issue.

Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or in this department, each must take his turn.

Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.

Scientific American Supplements referred to may be had at the office. Price 10 cents each.

Books referred to promptly supplied on receipt of price.

Minerals sent for examination should be distinctly marked or labeled.

(1780) A. J. S. asks for the list of subjects a man has to "pass" in order to become an "articled" clerk in pharmacy. A. These vary in different cities. In general they include chemistry, pharmacy, botany, materia medica, reading of and putting up difficult prescriptions, detection of incompatible and poisonous prescriptions, knowledge of doses, etc. Practical experience is generally necessary and is often required.

(1781) R. K. S. asks: What is the origin of the term carat as applied to gold and what it signifies? A. The word "carat," was derived from the Arabic "qirat," a bean or pea shell, weighing about 4 grains. The Arabians are supposed to have borrowed the word from a similar one in Greek, meaning a little horn, the fruit of the "carob" tree.

(1782) B. D. asks: 1. Of what material is the vibrating diaphragm of the Bell telephone receiver as now used made of? A. Thin iron, ferrotype plate. 2. How thick is it? A. About 1-100 inch thick. 3. What is its diameter? A. 2¾ inches. 4. Which pole of the permanent magnet is next to the diaphragm? A. It makes no difference. 5. I made a telephone as instructed in the SCIENTIFIC AMERICAN of December 14, 1889, Figs. 3, 4, and 5, using silk-covered wire, No. 36, and tintype diaphragm 1-112 inch thick. The distance from the core to the diaphragm is about 1-32 inch, but it fails to give a sound. What is the reason? A. You must have failed to follow the description in some particular. Possibly your fine wire is broken.

(1783) W. D. asks how he could make a canvas canoe waterproof. A. Paint over with a number of coats of white lead in oil. Sometimes the canvas is treated with paraffin melted in with a hot iron. 2. Would a proper battery in any way improve the bipolar telephones illustrated in your paper of December 14, 1889? A. The battery is not needed and would effect little if any improvement. If used it must be properly connected or it might neutralize the permanent magnetism.

(1784) H. S. asks: 1. Is there any way by which I could place a thin coating of metallic copper (similar to that on an electric light carbon) on a wooden surface? If so, please state how I must proceed. A. Make the wood waterproof by means of varnish or paraffin. Coat the surface evenly with fine plumbago and proceed as in electrotyping. The process of coating the wood with plumbago is like that of blacking a stove. 2. What shape of core makes the most powerful electric magnet? A. A cylindrical core of soft wrought iron is best.

(1785) F. F. B. asks: 1. What is a good receipt for preserving the feet of all kinds of animals, for a museum? (I want to make a collection of paws and claws.) A. Remove flesh and bones as far as possible by turning skin inside out, restore again to its original state and treat with turpentine internally, stuff it with cotton, and as a further preservative apply a clear alcoholic solution of corrosive sublimate. We recommend you the Taxidermist's Manual, which we can supply for 50 cents. 2. Where can a copy of Pratt Institute Record be obtained? A. Address the Pratt Institute, Brooklyn, N. Y.

(1786) A. W. T. McB. writes: Suppose I have a card printed on ordinary letter paper. What kind of a chemical process can I subject the paper to so that it will be impossible to efface the printing with pen and ink or with pencil? Or, in other words, what will put the paper in such a condition that it will not receive a mark from a pen or pencil? Is there any way to treat the sheet of paper upon which this question is written so that I cannot write on it with pen and ink or with pencil? A. By saturation with hot paraffin wax the paper will be so affected that writing on it with pen and ink will be very difficult, and with pencil almost as much so.

(1787) S. C. asks: Assuming a charge of 3 drachms of powder will produce a muzzle velocity of 100 in a 16 bore (0·69 in.) 30 inch barrel shot gun, how much powder must be used to produce the same muzzle velocity in a 10 bore (0·79 in.) 30 inch barrel, using same amount of shot? A. The charge should be inversely as the area, or 4 drachms.

(1788) W. C. E. asks: Will it make any difference in flow of liquid by adding to length of long leg of a siphon? Will siphon work if short leg is longer than 33 feet? If siphon is filled and both legs stopped and opened under water, will the liquid run out or vacuum at bend hold it? A. If lengthening the long leg of a siphon means greater difference in height, the flow will be greater. A siphon will not work well with over 30 feet vertical height between surface of water and apex of siphon. With the ends air sealed by dipping under water, the siphon will hold its charge and run when both ends are at different levels and open. Stop the flow by closing the discharge end. A chamber should be made at the apex to receive the air that separates from the water, that the siphon may have a longer run without refilling.

(1789) G. G. B. asks: 1. What chemicals (and in what way) are used to etch glass, such as are used to back window transparencies? A. Hydrofluoric acid is used for etching glass. Chemists furnish it of the proper strength for this purpose. The glass is dipped into the acid. Surfaces protected by wax will not be attacked by the acid. This acid is very corrosive, and produces painful sores when brought into contact with the skin. The fumes of the acid should not be inhaled. 2. How can I grind glass so it will have a smooth finish (as used in cameras)? A. You can grind glass by covering it with fine emery and water and rubbing it with a small piece of glass. For convenience in handling, a piece of cork may be attached to the small piece of glass for a handle.

(1790) A. S. asks how to make a hard and fine cement to imitate white limestone or white sandstone, etc. A. Use plaster of Paris mixed with strong solution of alum as the basis, color with any mineral pigment, mix with sand or ground pumice to modify the grain.

(1791) T. B. C. asks (1) how to make sawdust of any kind of wood as fine as flour or whiting, so as to form it into a smooth paste or mass without crumbling, or hardening, but keep a plastic state to make casts with? A. Mix with glue to desired consistency and form in oiled mould. Or use following: Glue 13 parts, litharge pulverized 4 parts, dry white lead pulverized 8 parts, plaster of Paris 1 part, sawdust 10 parts. Water enough to bring to proper consistency. First dissolve the glue, then add other ingredients. Oil the moulds. 2. How to keep glue in a liquid state without becoming watery and bad smelling. A. Soak glue in water, dissolve by heat, and add strong vinegar. This preparation will remain semi-liquid or fully liquid, according to quantity of vinegar. Nitric acid may be used instead of vinegar.

(1792) G. C. asks how to obtain hydrate of alumina from kaolin. A. Treat with small excess of sulphuric acid, evaporate until fumes of acid come off, cool, dilute, filter, and precipitate with ammonia, adding a slight excess only and heating until no more ammoniacal gas comes off.

(1793) P. E. McI. asks for a receipt to make a cement for a bellows made with sheep skin. A. Use best quality glue mixed with a little glycerine, about one-tenth the weight of the dry glue originally used.

(1794) D. H. asks: Can you tell me of a solution that will render a fishing line waterproof in salt water? A. Heat the perfectly dry line in melted paraffin, so as to saturate the fiber therewith.

(1795) Inquirer asks: How is stove putty made from mineral substances, and what is used to mix with it to make it harden after it is applied and the stove gets hot? A. Five parts clay, 2 parts fine iron filings, 1 part peroxide of manganese, ½ part salt, ½ part borax, pulverize and mix thoroughly in a mortar. Make into a thick putty with water and use immediately. Will set and harden with heat of the stove.

(1796) J. S. writes: 1. Please give a practical call to be used in connection with the simple telephone described in SCIENTIFIC AMERICAN of December 14, 1889, that will work five or ten miles. A. Use a magneto call. 2. How many Law batteries will be required to work a call bell two miles? A. With a good line, four cells would answer; with line as ordinarily constructed, you would probably need eight cells. 3. Can the batteries be placed at one end, and call both ways on a single wire? A. This can be done only on a closed circuit.

(1797) W. F. S. asks: 1. What is the method that is now used for the manufacture or reduction of aluminum? A. It is made: *a*. By reduction with sodium (Castner's process, in England). *b*. By electrolysis, Hall's process, in Pittsburg, Pa. *c*. In alloy with copper, etc., by the voltaic arc, Cowles' process, in Lockport, N.Y. 2. What is cost of manufacture? A. This is not disclosed. It can be bought in large quantities for $2.50 a pound. 3. Is pottery clay richest of all clays in aluminum? If not, what clay is richest? A. Corundum is the richest of its "ores." Pottery clay may contain a fair amount; cryolite is a very advantageous source. You will find many excellent papers on the above or other processes in our SUPPLEMENT, with illustrations of plant and many details.

(1798) W. S. S. asks: How to make a water-tight joint between glass and zinc, for a small aquarium. A. Melt together Burgundy pitch, 150 parts; gutta percha in sheets, 25 parts; ground pumice stone, 75 parts.

(1799) W. P. R. writes: There is a saying that a thunder storm will sour milk; is this true? If so, please say why it is. A. A considerable quantity of ozone is produced by the electric discharges in a thunder storm, which is a very active agent in accelerating chemical changes due to oxidation, of which the souring of milk, involving the formation of lactic acid, is an example.

(1800) D. W. R. asks: 1. What is hektograph paper, and where can it be procured? A. This is paper prepared with a gelatinous coating, which is capable of absorbing ink. It may be procured from any prominent stationer in New York. 2. Why can I receive no shock from a 100 light dynamo, and yet be very sensitive to the effect of a small galvanic battery? A. You can get a very severe shock from a 100 light dynamo by grasping two naked terminals of the conductor leading from the dynamo, one in each hand, bringing them together for an instant, then separating them. The shock is due to the extra current. Ordinarily a 100 light dynamo for incandescent lighting generates a current having an E. M. F. of 100 to 110 volts. By grasping the conductors while the machine is doing its normal work, no serious shock will be experienced, because the current has a comparatively low E. M. F. The induction coil to which you refer produces currents of very high E. M. F., running up to thousands of volts. These currents are alternating in their character, and are capable of affecting the nerves to a remarkable extent. Our advice is to take no electric shocks from dynamos.

(1801) C. D. asks: 1. Will wooden boxes coated with paraffine make good cells for a plunging bichromate battery? Would a mixture of pitch and coal tar be as good as paraffine? If so, what is the best proportion? A. Paraffine is apt to crack. If the box is made of well seasoned wood and provided with good joints, and if the paraffine is applied hot to both the inside and outside of the box, it would answer very well. We think pitch and coal tar would fail in a short time. 2. How can I reduce a piece of hard rouge to a powder or paste ready for use? A. If the rouge is mixed with gum, you can soften it with water. You can probably pulverise it in a mortar.

(1802) F. W. L. asks: 1. Can the iron wire ring, and the body of the field magnet of the simple electric motor described in your SCIENTIFIC AMERICAN SUPPLEMENT, No. 641, April 14, 1888, be cast out of iron? A. The field magnet may be made of cast iron, but the core of the armature should be made of soft iron wire. 2. Would this make the motor stronger or weaker? A. The cast iron armature would make no material difference in the power. 3. Is there any easy way of making this motor stronger? A. Connect as a shunt machine, and arrange your battery cells in parallel.

(1803) W. L. W. is informed that two solids which brought in contact will burst into a flame are a piece of phosphorus and a crystal of iodine.—A. T. O. [Some seconds are required to effect the result.—ED.]

(1804) E. C. R. writes: I noticed in a Chicago drug store the following: A tall glass jar which was nearly filled with a solution, which the clerk said was one of silica in some form. In the bottom of the jar was a deposit of some kind, which resembled fine sand. Upon this stood the growths of seven or eight of the "trees" of different metals, among them zinc, lead, and copper. I could not find out anything in regard to how the trees of different metals could be grown in the same vessel at the same time. Can you give me information in regard to it, as I would like to make one of four or five metals? A. The experiment you speak of is fully described and illustrated in "Home Experiments in Science," which we can supply for $1.50.

(1805) H. L. H. asks: Is there anything that will take a bad stain out of kersey cloth? The coat is of a light color, and the stain yellow. A. We cannot recommend any treatment better than scrubbing with soap and water, or sponging with alcohol. Success is doubtful.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

January 21, 1890.

AND EACH BEARING THAT DATE.

[See note at end of list about copies of these patents.]

Manifold, C. E. Mark 419,782
Mantel, sheet metal, J. Graves 419,659
Match safe, combination, F. A. Huehn 419,952
Matches, machine for wrapping block, G. Grisel 419,851
Mattress, woven wire, Hinkle & Ransom 419,589
Medicine, remedy for liver complaint, etc., J. Taylor 419,870
Metal casting furnace, H. B. Lynch 419,696
Metal wheel, P. Gendron 419,937
Milk can, W. C. Thornton 419,715
Mill. See Coffee mill. Feed mill. Roller mill.
Millstone pick, combination, W. Z. Bevis 420,003
Miter box, Herbert & York 419,772
Mould. See Candy mould.
Moulding machine, C. D. Clark 419,670
Money registering device, H. J. Anderson 419,639
Motor. See Electric motor. Thermo-dynamic motor.
Muffler, steam, H. Gudis 419,840
Musical instrument, L. V. Barnard 419,625
Nail machine, wire, J. B. Hastings 419,944
Nails, machine for making corrugated, A. Sampson 419,973
Nailing machine, W. S. Fitzgerald 419,762
Net, fly, R. H. Wagner 419,901
Nippers, T. G. Hall 419,695
Nut lock, L. A. Bloter et al 419,841
Oar, bow facing, J. H. Stewart 419,708
Ore washer, McLanahan & Kirk 419,790
Organs, key desk for, J. B. Treat 419,727
Ornamenting and embossing machine, E. Geisel 419,847
Package fastening device, M. E. Hanover 419,853
Package tie, E. C. Plumer 419,879
Panels, making ornamental open work, A. B. Cameron 419,636
Paperhanger's shears and roller combined, J. W. Rountree 419,712
Paper holder and cutter, roll, J. Zorr 419,811
Papermaking machine, suction apparatus for, M. Van Ryzin et al 419,901
Paper weight and envelope opener, combined, F. E. Knight 419,686
Paving block, G. Schreyer 420,020
Pencil holders, pointing apparatus to be employed in, F. W. H. Haas 419,766
Photographic camera, L. M. Berthon 419,910
Piano action, E. N. Cummings 420,007
Piano action, R. N. Hutchinson 419,678
Piano sounding board, A. J. Dewing 419,842
Pile covering, H. Anderson 419,938
Pipe, J. E. Turner 419,909
Pipe branch, S. Loyd 419,694
Pipe joints, apparatus for constructing cold packed, A. N. Rankin 419,905
Pipe wrench, D. J. Hurley 419,854
Piston cylinder, E. L. Blount 419,916
Planter, corn, A. Wenzel 419,808
Planter, seed, A. B. C. Deboam 419,839
Plastering, composition for, G. M. Ford 420,008
Plastic material, moulding machine for, Howell & Simmons 419,676
Plastic materials, frame and press for forming and hardening, J. F. Gesner 419,656
Plow, W. R. Hendricks 419,946
Plow cleaner, E. S. Ballentine 419,624
Plow point, J. S. Fox 419,935
Pole, vehicle, S. R. Bailey 419,894
Portable house, C. H. Leonard 419,859
Pot. See Coffee pot.
Press. See Baling press. Printing press.
Printers' rollers, apparatus for making, L. E. Bingham ..... 419,913 to 419,914
Printing machine delivery apparatus, L. C. Crowell 419,924
Printing machine delivery mechanism, L. C. Crowell 419,644
Printing mechanism, web, L. C. Crowell 419,642
Printing plates upon cylindrical surfaces, fastening for, J. A. Dear (r) 11,056
Printing press, W. H. Price, Jr 420,017
Printing presses, cushioning apparatus for, B. Huber 420,011
Protector. See Skirt protector.
Pulley, E. J. Pennington 419,791, 419,792
Pump, H. M. Johnston 419,957
Pump, bilge water, A. Cook 419,909
Pump piston, E. F. Sammons 419,713
Rail chair, J. J. Anderson 419,814
Railway, cable street, L. Heynemann 419,892
Railway, electric, M. W. Dewey 419,841
Railway gate, S. L. Adkins 419,619
Railway pneumatic switch and signal appliance, M. B. Mills 419,795
Railway signals, etc., mechanism for operating, G. N. Reiff 419,895
Railway, single rail elevated, J. N. Valley 419,729
Railway switch, N. L. Tuck 419,980
Railway system, electric, T. E. Adams 419,618
Railway system, electric, C. Crichter 419,709
Railway system, electrical, T. H. Hicks 419,675
Rake. See Hay rake.
Rattan structure, re-enforced, E. Depersenaire 419,839
Refuse can, underground, J. Zapp 419,905
Regulator. See Current motor regulator. Electro-thermal current regulator.
Rein holder, J. W. Lane 419,697, 419,698
Revolving hook machine, A. Miller 419,863
Roller. See Land roller.
Roller mill, J. L. Williford 420,026
Rolling screw threads, machine for, H. E. Jones 419,777
Roofing tool, J. W. & G. W. Crim 419,831
Rope clamp, J. Kinney 419,960
Rotary engine, J. B. Hart et al 419,770
Rubber from waste rubber goods, reclaiming, N. C. Mitchell 419,697
Rudder for vessels, duplex, V. F. Lasne 419,780
Safe and vault, G. J. H. Goehler 419,658
Safety trap for discharge pipes, E. K. Scott 419,717
Sand band, F. S. Rolfe 419,980
Sand screening apparatus, W. B. Craft 419,930
Sash cord fastener, N. Zorn 419,744
Sash fastener, D. O. Livermore 419,692
Sash fastener, D. B. Proctor 419,851
Sash fastener, Schade & Case 419,891
Saw gummer, gin, J. G. Falls 419,980
Saw stretching machine, N. W. Mortorff 419,699
Sawing machine, crosscut, R. S. & R. L. Greenlee 419,848
Scraper, shoe, C. A. Sparrow 419,901
Screen, Armstrong & Rankin 419,907
Screwdriver, V. Chantrell 419,678
Screw threads, machine for cutting right and left, Watson & Geiston 419,984
Seat. See Valve seat.
Secondary battery, J. F. Mohren 419,862
Sewers, ventilation for, Ford & Wright 419,764
Sewing machine attachment, B. Lindauer 419,781
Sheaf carrier, W. H. Baker 419,623
Shears. See Paperhanger's shears.
Sheet delivery mechanism, sealing attachment for, L. C. Crowell 419,835
Shirt, T. W. Aikenhead 419,812
Shutter worker, J. K. McIntkin 419,789
Sifter, ash, J. W. Dickinson 419,648
Sifter, rotary, B. H. Cook 419,751
Signal, J. J. Detwiller 419,840
Skirt protector, A. E. McQuiston 419,908
Sleeve holder, D. G. Butts 419,635
Soldering apparatus, J. H. Michener, Jr 419,785
Solid material, artificial, J. F. Gesner 419,657
Spinning machine, Dress & Swan 416,649
Spirometer, coin-released, C. F. Gillet 419,888
Spittoon, stationary, A. F. Brown 419,919
Spring. See Vehicle spring.
Stall floor, L. Hellner 419,670
Steam generator, J. J. Bush 419,634
Steering and propelling mechanism for floating batteries, etc., J. B. Hallett 419,941
Stone, manufacture of artificial, J. F. Gesner 419,655
Stove, gas, J. H. Carrington 419,827
Stove, heating, C. A. Richardson 419,706
Sulphochlorinated organic compounds, neutralizing, A. Sommer 419,738
Switch. See Railway switch.
Table. See Ironing table.
Table, J. H. Taylor 419,978
Teeth, manufacture of pads for cleaning and polishing the, G. F. Horsey 419,675
Telephone circuit and apparatus, J. N. Culbertson 419,645
Telephone, mechanical, R. C. M. Bowles 419,986
Thermo-dynamic motor, C. W. Weiss 419,805
Thill coupling, Hunt & Fowler 419,773
Thill coupling, C. R. Moore 420,015
Thill coupling, F. M. & J. H. Richardson 419,898
Thrashing machine, S. King 419,959
Thrashing machine, W. M. Koppes 419,688
Tie. See Package tie.
Tile machines, cut-off table for, A. Mark 419,782
Tongue support, W. B. Davis 419,837
Tool handle, R. Huller 419,953
Toy, F. W. Dennis 419,754
Transfer carriage for elevated ways, W. S. Bogle 419,629
Transom lifter, J. Kelly 419,680, 419,681
Transom lifter, F. A. Lippert 419,964
Trap. See Animal trap. Safety trap.
Truck, car, E. Peckham ..... 419,870 to 419,873
Trunk, W. W. Brinkerhoff 419,619
Tug, hame, Smith & North 419,800
Turning chair legs, rounds, and the like, tool for, W. M. Palmer 419,973
Turret and turreted barbettes for guns, J. B. G. A. Canet 419,981
Typewriting machine, C. T. Moore 419,864
Typewriting machines, type bar for, R. A. Brandenburg 420,005
Valve gear for fluid rams and pistons, J. Parkin 479,874
Valve seat, glass, J. H. Shea 419,730
Veneer cutting machine, E. F. Smith 419,975
Vehicle roof, J. H. Ficken 419,759
Vehicle spring, E. Jarrell 419,956
Ventilating conduits, J. H. Hilliker 419,998
Violins, sounding post for, M. W. White 420,025
Vise, milling machine, F. H. Richards 419,894, 419,895
Wagon body, T. Tyson 419,904
Wagon body, folding, L. G. Locke 419,695
Wagon box, collapsible, D. C. Lang 419,680
Wagon brake, H. B. Beairsto 419,626
Wagon, farm, J. Herby 419,672
Wagon skein, J. Herby 419,991
Washer. See Ore washer. Window washer.
Washing machine, H. Ernst 419,932
Washing machine, S. Hawkins 419,669
Washing machine, H. Q. Hood 420,011
Washing machine, J. Starck 419,732
Washing machine, J. D. Yound 419,904
Washing machines, reversing mechanism for, J. E. Boardman 419,627
Watch, stem winding and setting, B. Frese 419,654
Water chute or flume and water basins, H. W. Libbey 419,980
Water gauge, A. Worthington 419,749
Water heater, C. B. Rice 420,019
Weather strip, T. Hibbert 419,949
Web severing mechanism, L. C. Crowell 419,835
Weigher, automatic grain, J. Henry 419,947, 419,948
Well boring apparatus, L. V. Elder 419,757
Well drilling machine, Bowers & Hamilton 420,004
Wheel. See Car wheel. Fifth wheel. Metal wheel.
Wheel and axle, J. P. Spicer 419,895
Whip socket, F. E. Benton 419,815
Window glass, J. H. Reynolds 419,982
Window washer, W. Orcutt 419,871
Wire stretcher, A. Morrison 419,865
Wood, means for joining, E. J. Fletcher 419,764
Wood, preserving, C. T. Lee 419,858
Wrench. See Pipe wrench.
Wrench, B. G. Berrien, Jr 419,816

TRADE MARKS.

Baking powder, Vapor Baking Powder Co 17,427
Beer made from hops and malt, Singer & Wheeler 17,423
Biscuits, crackers, and wafers, Holmes & Coutts 17,417
Champagne, Thomas & Co 17,426
Crabs and crab meat, deviled, W. B. Smith 17,424
Cure for piles, H. Kephart 17,418
Grapes, Chautauqua Grape Growers' Shipping Association 17,409
Guano, R. A. Wooldridge & Co 17,420
Oil, rape seed oil, and other oils for burning and salad purposes, olive, O. Tamagno 17,425
Soap, Procter & Gamble 17,420, 17,421
Tablets, blankbooks, and the like goods, S. E. & M. Vernon 17,428
Trousers, M. Baum 17,422
Twines, marlines, cords, and ropes, Ludlow Manufacturing Company 17,419
Watch movements, American Waltham Watch Company 17,406
Yarns, A. J. Cameron & Co 17,407, 17,408
Yarns and threads of all kinds, Finlayson, Bousfield & Co ..... 17,410 to 17,416

DESIGNS.

Bottle case, M. & A. Gerstendorfer 19,592
Breast pump, J. L. Hancock 19,593
Dish, C. E. Haviland ..... 19,594 to 19,596
Neckwear, gentlemen's, L. S. Hills 19,597
Panel, A. B. Cameron 19,590
Pipe bracket, steam, J. H. Alexander 19,588
Purse, S. Cottle 19,591
Rug, W. T. Smith ..... 19,598 to 19,607
Wall and ceiling covering, C. C. Hiscoe ..... 19,598 to 19,601
Watch case, T. Bonfield 19,589

A Printed copy of the specification and drawing of any patent in the foregoing list will be furnished from this office for 25 cents. In ordering please state the name and number of the patent desired, and remit to Munn & Co., 361 Broadway, New York.

Canadian Patents may now be obtained by the inventors for any of the inventions named in the foregoing list, provided they are simple, at a cost of $40 each. If complicated, the cost will be a little more. For full instructions address Munn & Co., 361 Broadway, New York. Other foreign patents may also be obtained.

THE Scientific American

ESTABLISHED 1846.

The Most Popular Scientific Paper in the World.

Only $3.00 a Year, including Postage. Weekly. 52 Numbers a Year.

This widely circulated and splendidly illustrated paper is published weekly. Every number contains sixteen pages of useful information and a large number of original engravings of new inventions and discoveries, representing Engineering Works, Steam Machinery, New Inventions, Novelties in Mechanics, Manufactures, Chemistry, Electricity, Telegraphy, Photography, Architecture, Agriculture, Horticulture, Natural History, etc. Complete List of Patents each week.

Terms of Subscription.—One copy of the SCIENTIFIC AMERICAN will be sent for *one year*—52 numbers—postage prepaid, to any subscriber in the United States, Canada or Mexico, on receipt of **three dollars** by the publishers; six months, $1.50; three months, $1.00.

Clubs.—Special rates for several names, and to Post Masters. Write for particulars.

The safest way to remit is by Postal Order, Draft, or Express Money Order. Money carefully placed inside of envelopes, securely sealed, and correctly addressed, seldom goes astray, but is at the sender's risk. Address all letters and make all orders, drafts, etc., payable to

MUNN & CO.,
361 Broadway, New York.

THE Scientific American Supplement.

This is a separate and distinct publication from THE SCIENTIFIC AMERICAN, but is uniform therewith in size, every number containing sixteen large pages full of engravings, many of which are taken from foreign papers, and accompanied with translated descriptions. THE SCIENTIFIC AMERICAN SUPPLEMENT is published weekly, and includes a very wide range of contents. It presents the most recent papers by eminent writers in all the principal departments of Science and the Useful Arts, embracing Biology, Geology, Mineralogy, Natural History Geography, Archæology, Astronomy, Chemistry, Electricity, Light, Heat, Mechanical Engineering, Steam and Railway Engineering, Mining, Ship Building, Marine Engineering, Photography, Technology, Manufacturing Industries, Sanitary Engineering, Agriculture, Horticulture, Domestic Economy, Biography, Medicine, etc. A vast amount of fresh and valuable information obtainable in no other publication.

The most important Engineering Works, Mechanisms, and Manufactures at home and abroad are illustrated and described in the SUPPLEMENT.

Price for the SUPPLEMENT for the United States and Canada, $5.00 a year, or one copy of the SCIENTIFIC AMERICAN and one copy of the SUPPLEMENT, both mailed for one year for $7.00. Single copies 10 cents. Address and remit by postal order, express money order, or check,

MUNN & Co., 361 Broadway, N. Y.,
Publishers SCIENTIFIC AMERICAN.

Building Edition.

THE SCIENTIFIC AMERICAN ARCHITECTS' AND BUILDERS' EDITION is issued monthly. $2.50 a year. Single copies, 25 cents. Forty large quarto pages, equal to about two hundred ordinary book pages; forming a large and splendid **Magazine of Architecture,** richly adorned with *elegant plates in colors,* and with other fine engravings; illustrating the most interesting examples of modern Architectural Construction and allied subjects.

A special feature is the presentation in each number of a variety of the latest and best plans for private residences, city and country, including those of very moderate cost as well as the more expensive. Drawings in perspective and in color are given, together with full Plans, Specifications, Sheets of Details, Estimates, etc.

The elegance and cheapness of this magnificent work have won for it the **Largest Circulation** of any Architectural publication in the world. Sold by all newsdealers. $2.50 a year. Remit to

MUNN & CO., Publishers,
361 Broadway, New York.

A New and Important Book on Metallic Alloys, Solders, etc.

NOW READY.

THE METALLIC ALLOYS

A Practical Guide for the Manufacture of all Kinds of Alloys, Amalgams, and Solders used by Metal Workers, together with their Chemical and Physical Properties and their Application in the Arts and the Industries; with an Appendix on the Coloring of Alloys. Translated and edited, chiefly from the German of A. Krupp and Andreas Wildberger, with extensive additions, by Wm. T. Brannt, one of the editors of "The Techno-Chemical Receipt Book," etc. Illustrated by 16 engravings. 12mo, 423 pages. Price.....$2.50

☞ *By mail, free of postage, to any address in the world.*

☞ *A descriptive circular giving the full contents of the above book sent free to any one who will apply.*

☞ *The above or any of our Books sent by mail free of Postage, at the publication prices, to any address in the world.*

☞ *Our New and Revised Catalogue of Practical and Scientific Books, 96 pages, 8vo, and our other Catalogues, the whole covering every branch of Science applied to the Arts, sent free and free of postage to any one in any part of the world who will furnish his address.*

HENRY CAREY BAIRD & CO.,
INDUSTRIAL PUBLISHERS, BOOKSELLERS & IMPORTERS
810 Walnut St., Philadelphia, Pa., U. S. A.

ARCHITECTURAL BOOKS.

Useful, Beautiful, and Cheap.

To any person about to erect a dwelling house or stable, either in the country or city, or any builder wishing to examine the latest and best plans for a church, school house, club house, or any other public building of high or low cost, should procure a complete set of the ARCHITECTS' AND BUILDERS' EDITION of the SCIENTIFIC AMERICAN.

The information these volumes contain renders the work almost indispensable to the architect and builder, and to persons about to build for themselves they will find the work suggestive and most useful. They contain colored plates of the elevation, plan, and detail drawings of almost every class of building, with specification and approximate cost.

Eight bound volumes are now ready and may be obtained, by mail, direct from the publishers or from any newsdealer. Price, $2.00 a volume. Stitched in paper covers. Subscription price, per annum, $2.50. Address and remit to

MUNN & CO., Publishers,
361 Broadway, New York.

BARREL, KEG, Hogshead, AND STAVE MACHINERY.
Over 50 varieties manufactured by
E. & B. Holmes,
BUFFALO, N. Y.
Truss Hoop Driving.

Shipman Automatic Steam Engine
KEROSENE OIL FUEL.
STATIONARY and MARINE.
1, 2, 4, 6, and 8 Horse Power Single, and 8, 12, and 16 Horse Power Compound.
THE SHIPMAN STEAM LAUNCHES
From 22 to 50 feet in Length.
SAFE, ROOMY, DESIRABLE.
Send for Catalogue. Mention SCI. AM.
SHIPMAN ENGINE CO., 200 SUMMER STREET, BOSTON, MASS.

SOME APPLICATIONS OF ELECTRIC Transmission.—A lecture by Frank J. Sprague, delivered in the Sibley College course, explaining the various methods of transmitting energy by electricity and the operation and government of motors, and reviewing some of the many applications that have been made in this line. With 14 illustrations. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, Nos. **707, 708,** and **709.** Price 10 cents each. To be had at this office and from all newsdealers.

SEATTLE The "Queen City" and Metropolis of the New State of Washington

For Illustrated Descriptive Matter write to the Leading Real Estate and Financial Brokers Seattle.
Crawford & Conover

IS YOUR LIFE SAFE AT HOME?

Now is the season of the year when your house is shut up and you are liable to breathe impure air from a lack of sufficient ventilation. This breeds disease, and is absolutely dangerous to those who do not get plenty of out-door air.

Every Family should have the **Sherman 'King' Vaporizer.** This simple and **inexpensive device** purifies the air in every place indoors.

It Never Fails. Especially needed in Schools and Churches. Send for particulars.

SHERMAN "KING" VAPORIZER CO., Chicopee Fa'ls, Mass.

ELECTRO-DYNAMIC REPULSIONS and Rotations.—Description of an interesting series of experiments with the alternating current, due to Prof. Elihu Thomson. With 8 figures. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **714.** Price 10 cents. To be had at this office and from all newsdealers.

STEEL TYPE for TYPEWRITERS, Stencils, Steel Stamps, Rubber and Metal Type Wheels.
New York Stencil Works, Mfrs.
100 Nassau Street, New York.

Penberthy Automatic Injector.
Cost less than others and do equal work. Lift 20 feet and work from head as well. Restart themselves and require no watching. Will lift through hot pipes, work from 25 to 150 lbs. pressure. Parts removable without disconnecting, also interchangeable. Send for pamphlet.
Penberthy Injector Co., Detroit, Mich.
Donegan & Swifts, 174 Fulton St., New York.
Park & Lacy, San Francisco.
L. M. Rumsey Mfg. Co., St. Louis.

BARNES' PAT. FOOT POWER MACHINERY.
I feel so highly pleased with your Velocipede Foot Power with seat, that I wish to add my testimony to its superiority. I did not expect to like it, but having used the Velocipede Power, I would have nothing else. It so greatly lessens the fatigue of using foot power, in fact, it may be said to be almost without fatigue, and is a steadier motion. I only wish I had known of it sooner. Send for catalogue. W. F. & J. BARNES CO., 999 Ruby St., Rockford, Ill.

Name and Locate all Stars and Constellations visible by using Whitall's Planispheres. Use Whitall Telescope, Heliotellus, Lunatellus, Magic Lanterns and Slides, Books etc. W. T. Cooper, Mgr., P. O. Box 62, Woodbury, N. J.

MOSS ENGRAVING CO. 535 PEARL ST. NEW YORK. cor. Elm. St.
ENGRAVINGS for BOOKS, NEWSPAPERS and CIRCULARS
SEND GREEN STAMP FOR CIRCULAR—SEND PHOTOGRAPH, DRAWING or PRINT for ESTIMATE
When writing to us please mention SCIENTIFIC AMERICAN.

NOW READY.

Experimental Science,

BY GEO. M. HOPKINS.

740 Pages. 680 Illustrations.

PRICE, by mail, postpaid, ... $4.00

SEND for FREE ILLUSTRATED CIRCULAR and Table of Contents.

MUNN & CO., Publishers,
Office of The Scientific American,
361 Broadway, New York.

MAGIC LANTERNS

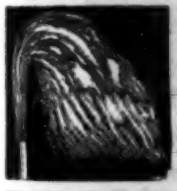
AND STEREOPTICONS FOR SCHOOLS & PUBLIC ENTERTAINMENTS
LANTERN SLIDES COLORED & UNCOLORED
SEND FOR CATALOGUE **QUEEN & CO.** PHILA. PA.

TO INVENTORS!--PATENTS, Trade Marks and Copyrights. Agency Office for ITALY.—Rome E., via Cavour 196. L. GATTA. Highest references. English correspondence.

WORKING MODELS & LIGHT MACHINERY. INVENTIONS DEVELOPED. Send for Model Circular. Jones Bros. & Co., Cin'ti, O.

Lightning Well-Sinking Machinery.
Makers of Hydraulic, Jetting, Revolving, Artesian, Mining, Diamond, Tools, Well & Prospecting Engines, Boilers, Wind Mills, Pumps, etc. Send on TRIAL. An ENCYCLOPEDIA of 1,000 Engravings, Earth Stratification, Determination of Minerals and Quality of Water, Gives Light, finds Gold. Mailed for 25 cts. Gas Book 10 cts.
The American Well Works,
AURORA, ILL.

OIL WELL SUPPLY CO. Ltd.
91 & 92 WATER STREET,
Pittsburgh, Pa.,
Manufacturers of everything needed for
ARTESIAN WELLS
for either Gas, Oil, Water, or Mineral Tests. Boilers, Engines, Pipe, Cordage, Drilling Tools, etc. Illustrated catalogue, price lists and discount sheets on request.



ARTESIAN
Wells, Oil and Gas Wells, drilled by contract to any depth, from 50 to 3000 feet. We also manufacture and furnish everything required to drill and complete same. Portable Horse Power and Mounted Steam Drilling Machines for 100 to 400 ft. Send 6 cents for illustrated catalogue. Pierce Artesian and Oil Well Supply Co., 30 Beaver Street, New York.

Scientific Book Catalogue

RECENTLY PUBLISHED.

Our new catalogue containing over 100 pages, including works on more than fifty different subjects. Will be mailed free to any address on application.

MUNN & CO., Publishers Scientific American.
361 Broadway, New York.

CLARK'S NOISELESS RUBBER WHEELS.
Absolutely prevents splintering and wearing of floors caused by use of iron wheels.
Adapted for Trucks, Boxes, Baskets, Tables and work of every kind in Mills, Warehouses, etc. Also furniture casters. Catalogue free.
Geo. P. Clark, Box L Windsor Locks, Conn.

PERFECT NEWSPAPER FILE

The Koch Patent File, for preserving newspapers, Magazines, and pamphlets, has been recently improved and price reduced. Subscribers to the SCIENTIFIC AMERICAN and SCIENTIFIC AMERICAN SUPPLEMENT can be supplied for the low price of $1.50 by mail, or $1.25 at the office of this paper. Heavy board sides; inscription "SCIENTIFIC AMERICAN" in gilt. Necessary for every one who wishes to preserve the paper. Address
MUNN & CO., Publishers SCIENTIFIC AMERICAN.

DEAF HEAD NOISES CURED by Peck's INVISIBLE TUBULAR EAR CUSHIONS. Whispers heard. Comfortable. Successful when all Remedies Fail. Illustrated book & proofs free. Address F. HISCOX, 853 Broadway, New York.

PULLEYS, HANGERS, FRICTION CLUTCHES. PROGRESS MACHINE WORKS, A. & F. BROWN, 44 Park Place, N. Y.

CUTLER DESK. BEST IN THE WORLD. A CUTLER & SON, BUFFALO, N.Y., U.S.A.

USE Perforated Electric Belting
—FOR—
SWIFT RUNNING MACHINERY.
Write for Descriptive Catalogue to
CHAS. A. SCHIEREN & CO.
45-51 FERRY ST., NEW YORK.

FOR LINING WALLS AND FLOORS TO PREVENT WARMTH ESCAPING AND DEADENING SOUND, USE **MINERAL WOOL.** SAMPLES AND CIRCULARS FREE U.S. MINERAL WOOL CO. 2 CORTLANDT ST. NEW YORK CITY, U.S.A.

HOW TO MAKE DYNAMO-ELECTRIC Machines.—By Geo. M. Hopkins. With drawings to scale and full directions for constructing dynamos of different sizes. The small machine is intended for experimental purposes. Will heat from 4 to 6 inches of platinum wire, produce the electric light, decompose water rapidly, magnetize steel, ring a large gong, give powerful shocks, operate induction coils, and will, for temporary use, replace 8 or 10 Bunsen cells. Contained in SUPPLEMENTS **161** and **599.** Price 10 cents each. The larger machine produces eight 16-candle lights or one powerful arc light. Can be arranged as a series, shunt, or compound wound machine. Can be run for a short time by two or four men. Requires one horse power for continued running. Best engravings of dynamo ever produced. Details of every part shown. Winding of armature and field magnet plainly illustrated. Any intelligent person with the aid of these drawings and instructions may make useful, durable, and effective machines. Contained in SUPPLEMENT **600.** Price 10 cents.
MUNN & CO., PUBLISHERS, 361 Broadway, New York.

25c FOR THIS STAMP. 25c
Send us 13 two cent stamps and we will send you by Mail one of these Beautiful Self-Inking Stamps, with Your Name, Ink, Box, &c. Postpaid.
CONOLLY & Co. Rochester, N.Y.

AGENTS WANTED by an old reliable firm; large profits; quick sales; SAMPLE FREE. A rare opportunity. Geo. A. Scott, 842 Broadway, N. Y.

THE BEST LIME KILN KNOWN or no pay. C. D. PAGE, Rochester, N. Y.

ASBESTOS Fire Felt Coverings, Packings, Sheathings, &c.
The CHALMERS-SPENCE CO., Mfrs.
419-425 8th Street, East River, N. Y.

THE PENNA. DIAMOND DRILL & MFG. CO.
BIRDSBORO, PA., Builders of High Class Steam Engines, Diamond Drilling and General Machinery. Flour Mill Rolls Ground and Grooved.

TYPEWRITERS

Send for New Illustrated Catalogue describing all Machines. Largest stock in America.
New or Second-hand Typewriters of all makes.
Machines Rented in any part of the country. Supplies in abundance. Prices the lowest.
NATIONAL TYPEWRITER EXCHANGE,
161 La Salle Street, Chicago, Ill.

WEITHNER PATENT FURNACE. BOILERS OF EVERY DESCRIPTION.
IDE AUTOMATIC ENGINES. Traction and Portable Engines.
STEAM ROAD ROLLERS.
Manufactured by FOUNDRY & MACHINE DEPT., Harrisburg, Pa., U. S. A.

CELEBRATED SUTTON RING PACKING
PIONEER RUBBER PACKING POSITIVELY ANTI-FRICTION SPECIALLY ENDORSED FOR HIGH SPEED ENGINES

Navy Department, Washington, D. C., December 27, 1889.—Competitive trials of armor plates will be held by the Navy Department at the Naval Ordnance Proving Ground, Annapolis, Md., or at such other place as may be designated. The armor plates submitted must be 6 feet by 5 feet and 10½ inches thick. Those who intend to furnish armor plates for trial can obtain full information concerning the tests by communicating with the Bureau of Ordnance, Navy Department. Notice of intention to compete in this trial must be received by the Bureau of Ordnance on or before February 10, 1890. B. F. TRACY, *Secretary of the Navy.*

To Engineers and Contractors.—OFFICE OF THE LIGHT-HOUSE BOARD, Washington, D. C., January 9, 1890.—Proposals will be received at this office until 12 o'clock noon on Tuesday, the 1st day of July, 1890, for the design, the specifications, the complete construction and equipment, and the temporary maintenance of a light-tower on Diamond Shoal, off Cape Hatteras, North Carolina. By an Act of Congress the total cost of the light-station shall not exceed the sum of $500,000. Specifications embodying the requirements of the structure, forms of proposals, and other information may be obtained on application at this office. The right is reserved to reject any or all bids and to waive any defects. DAVID B. HARMONY, *Rear-Admiral U. S. N., Chairman.*

ADVERTISER IS OPEN TO BUY OR TO work on Royalty the British Patent of any good invention. Buys also Novelties of all kinds. Bankers' references. Correspondence and samples solicited. T. M. CLARKE, ROMILEY, MANCHESTER, ENGLAND.

A NEW CATALOGUE OF VALUABLE PAPERS
Contained in SCIENTIFIC AMERICAN SUPPLEMENT, sent *free of charge* to any address.
MUNN & CO., 361 Broadway, New York.

EVERY USER OF MACHINERY
SHOULD LEARN
How to Use Loose Pulleys.
Useful information on this subject is given in our "Catalogue No. 55." Sent free to any address.
VAN DUZEN & TIFT, Cincinnati, O.

The Scientific American

PUBLICATIONS FOR 1890.

The prices of the different publications in the United States, Canada, and Mexico are as follows:

RATES BY MAIL.

The Scientific American (weekly) one year	$3.00
The Scientific American Supplement (weekly), one year,	5.00
The Scientific American, Spanish Edition (monthly) one year,	3.00
The Scientific American, Architects and Builders Edition (monthly), one year,	2.50

COMBINED RATES.

The Scientific American and Supplement,	$7.00
The Scientific American and Architects and Builders Edition,	5.00
The Scientific American, Supplement, and Architects and Builders Edition,	9.00

Proportionate Rates for Six Months.

This includes postage, which we pay. Remit by postal or express money order, or draft to order of
MUNN & CO., 361 Broadway, New York.